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. . . . No. 11.

339081

ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND
COMMISSIONERS.

FOR THE YEAR 1903.



BOSTON :

WRIGHT & POTTER PRINTING CO., STATE PRINTERS,

18 POST OFFICE SQUARE.

1904.

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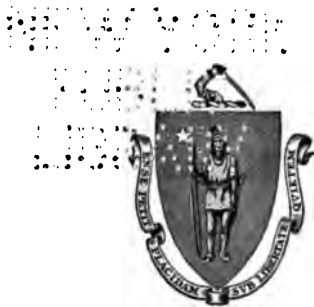
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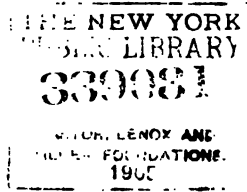
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• APPROVED BY
THE STATE BOARD OF PUBLICATION.

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YEAR 10

Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1903, covering a period of twelve months, from Nov. 30, 1902.

From Dec. 1, 1902, to Nov. 30, 1903, the Board has held 226 meetings, has given 258 formal and informal hearings, and has received 140 petitions for license to build and maintain structures and for privileges in tide waters, great ponds and Connecticut River, to dredge material, to remove material from beaches, and for other purposes.

One hundred and twenty-one licenses for structures and privileges in tide waters, great ponds and Connecticut River, have been granted during the year; also 21 permits for dredging, for the removal of material from beaches, and for other purposes.

Eighty-five inspections have been made at various times by the Board, and under its direction, of work completed and in progress, also of sites of authorized work, under appropriations made by the Legislature, relating to: dredging operations in Boston harbor; improvements on the Commonwealth's flats at South Boston; improvements in South Bay; the reclamation of the Province Lands in Provincetown; protective works on the Connecticut River at Hadley; bank of Connecticut River at Hatfield; Annisquam River in Gloucester; Bass River in Beverly; sea wall and jetties at

Stony Beach in Hull; sea wall at North Scituate; site of proposed wall on beach between the first and second cliffs in Scituate; breakwater in Apponagansett harbor; Quicks Hole and ponds on Nashawena Island; Stage harbor in Chatham; jetties and channel at Menamsha Inlet; jetties and channel at Lake Anthony; Nantucket harbor; jetties and channel in Bass River at South Yarmouth; East and West bays at Osterville; Herring River at West Harwich; Witchmere harbor in Harwich; also, upon petitions and plans presented to the Board, of the sites of proposed work in tide waters, great ponds and Connecticut River, the location of wrecks and obstructions to navigation, and various structures built under licenses from the Board; piers and docks in New York city; sites suggested for location of a new drawbridge between Fall River and Somerset.

Through transactions of the Board there has been paid into the treasury of the Commonwealth during the past year, from rents, licenses, sales of land and other sources, and credited to the Commonwealth's flats improvement fund and the harbor compensation fund for Boston harbor, the aggregate sum of \$57,162.87.

During the year the Board made 4 new contracts,* involving the estimated expenditure of \$28,513.10.

COMMONWEALTH TIDE LANDS.

The Governor and Council, under the provisions of section 24 of chapter 96 of the Revised Laws, determined that the compensation for the rights granted in land of the Commonwealth, to be filled or otherwise occupied under the following licenses granted by the Board during the year, should be as stated below:—

No. 2692, granted December 18, to the city of Boston, to repair and extend its wharf at Rainsford Island, in Boston harbor, \$18.66.

No. 2694, granted December 18, to the American Linen Company, to build a sea wall and fill solid on Taunton River, in Fall River, \$100.

No. 2695, granted December 18, to the Fall River Iron

* See Appendix A.

Works Company, to build a sea wall and fill solid on Taunton River, in Fall River, \$100.

No. 2727, granted April 15, to the Boston, Revere Beach & Lynn Railroad Company, to build a pile structure and dolphins, to fill solid and dredge, in Boston harbor, at East Boston, \$760.80.

No. 2750, granted June 22, to Paul Butler, to extend his wharf in Gloucester harbor, \$1,000.

No. 2758, granted June 29, to John Duff, to extend his wharf on Acushnet River at the easterly side of Fish Island, in New Bedford, \$300.

No. 2762, granted July 8, to Reed & Gamage, to extend their wharf in Gloucester harbor, \$300.

No. 2772, granted July 20, to the J. M. Guffey Petroleum Company, to build a wharf and bulkhead and fill solid in Beverly harbor, in Beverly, \$2,500.

No. 2773, granted July 29, to the Old Colony Street Railway Company, to build a sea wall and fill solid in Mount Hope Bay, in Fall River, \$2,000.

No. 2779, granted September 11, to the Whitman Mills, to build a bulkhead and fill solid on Acushnet River, in New Bedford, \$100.

No. 2783, granted September 21, to Sylvanus Smith, to extend his wharf in Gloucester harbor, \$200.

No. 2798, granted October 27, to the Fall River Gas Works Company, to build a wharf in Mount Hope Bay, in Fall River, \$1,000.

BOSTON HARBOR.

The importance of the port of Boston to the Commonwealth can never be overestimated. It is the natural tide-water doorway for the great north-west, and every step of development of that territory in raising products for shipment abroad is of vital interest to the capital city of New England. The influx of upwards of 50,000 people into the Manitoba, Assiniboia, Alberta and Saskatchewan districts is a movement of distinct advantage to Massachusetts. Such Canadian winter ports as are open cannot enter into competition on even rates, and it is for the interest of the railroads centring here to get the travel and the business.

The vote of the people of the State of New York to enlarge the Erie canal for navigation by 1,000-ton barges, at an outlay of over \$100,000,000, is an interesting object lesson to us. The increased export of cereals by way of the Mississippi and St. Lawrence rivers emphasizes the existing competition, and points the necessity of reducing cost of transportation through the northern Atlantic seaports, if their due proportion of the entire business is to be retained. Shipments through Boston must of necessity be all rail to the port; consequently, competing economy must be found in increase of economic facilities at the terminal by way of enlarged accommodations, cheap handling and quick despatch.

The advantage of being but 9 miles from the open sea, as against 27 in New York, and about 500 from Montreal down the St. Lawrence, counts for something. The saving of 180 miles as against New York in the ocean passage to Great Britain and the continent of Europe is another favorable item. The increase in the depth and width of our harbor channels, when the same shall be dredged and liberally buoyed and lighted, should be another factor of advantage, by making a quicker, easier and safer waterway between the docks and the ocean. The closing of the St. Lawrence to winter navigation affords an opportunity for creating a closer relationship between the railroads centring at Montreal and Boston, with a view to making Boston the winter port for upper Canada.

The abrogation in September last by the International Mercantile Marine of the minimum freight rates on foreign exports tends to give freer play to the natural advantages possessed by our great seaports, and its influence was immediately felt here by increase of shipments.

The 1899 project of the federal government for a new ship channel from President Roads to the sea through Broad Sound, 30 feet deep at mean low water and 1,200 feet wide, is substantially complete and ready for navigation by the largest ocean steamships when sufficiently buoyed and lighted. More buoys are needed to guide the mariner through a new passage than through one well known, and a

conservative captain or pilot is slow to adopt a change until the more adventurous or enterprising have established its superiority. The greater safety and shorter course of the Broad Sound channel will, however, in due time be recognized as a great and beneficial improvement.

A lighthouse of granite, with a light of the first order, is building at the outer Graves to mark the entrance to Broad Sound, on a location ceded to the United States by the Commonwealth at the last session of the Legislature.

The Congress of 1902 approved the project for another channel through Broad Sound, 35 feet deep at mean low water and 1,500 feet wide, to President Roads, and for deepening the main channel from President Roads to the Charlestown and Chelsea bridges to 35 feet at mean low water and broadening it to 1,200 feet where possible, at an expense of about \$8,000,000, and authorized contracts to the amount of \$3,600,000 for beginning and prosecuting the work. Contracts have been let, and the work is progressing. The summary of work done by Lieut.-Col. W. S. Stanton, Corps of Engineers, U. S. A., on page 56 of this report, shows the present condition of the project.

A comparison between the tonnage entering the principal ports of the world, according to a table prepared by the Department of Commerce and Labor at Washington, and the port of Boston, may be interesting. The coastwise trade is excluded.

PORT.	Year.	Entered (Tons).	Cleared (Tons).
London,	1902	10,179,023	7,385,085
New York,	1902	8,982,767	8,415,291
Antwerp,	1902	8,373,528	8,347,483
Hamburg,	1902	7,860,323	7,993,166
Hongkong,	1901	7,383,683	7,340,586
Liverpool,	1902	6,843,200	6,314,514
Cardiff,	1902	4,688,088	7,868,556
Rotterdam,	1901	5,950,445	5,733,763
Singapore,	1901	5,459,032	5,453,999
Marseilles,	1902	4,911,784	4,552,088
Tyne ports,	1902	3,615,046	4,754,301
Gibraltar,	1901	4,171,350	4,159,272
Boston,	1902	2,416,918	1,852,078

While the showing indicates much to be gained by Boston in order to equal the tonnage at the port next higher, it is encouraging to turn back and see the growth here since 1875, when the registered tonnage entered was 768,678, and that cleared 632,873.

The ports that want the business must provide required accommodation. The tendency continues toward increasing the size of vessels; and their limit, which is measured solely by economic considerations, has as yet not been reached. Meanwhile, two steamships to sail under the flag of the United States are building for the trade between Puget Sound and the Orient, with a carrying capacity of 25,000 to 28,000 tons, in which the ratio between the cost of carrying and handling cargo has been most carefully considered.

In this connection it is worth noticing that Philadelphia is asking the federal government for a channel down the Delaware, to be dredged to a depth of 40 feet; and that Liverpool, whose expenditures for commercial improvements never halt, is about providing at some of her docks for a depth of 40 feet on the sills at high water of neap tides, and for the accommodation of vessels 1,000 feet in length. Provision is also being made at Liverpool for several new graving docks, one of which, at the South Carriers Dock, is to be 800 feet long. One or more adequate graving docks are deemed essential to every foreign port of the first class.

ANCHORAGE.

The work of excavating additional anchorage ground in Boston harbor, as authorized by chapter 476 of the Acts of 1901, which also provides for the expenditure of an amount not exceeding \$1,000,000 out of the Commonwealth's flats improvement fund for carrying out the provisions of the act, has been prosecuted during the year under contracts made in 1902. The work is divided into four sections, the larger part of the material excavated being dumped at sea. A portion of the material from Section 1 is being used for filling the Commonwealth's flats at South Boston.

Owing to the large amount of work now being done in the harbor by the federal government and private parties, all

dredges have been fully employed, and the contractors have not been able to comply with the full requirements of the specifications for excavating the anchorage.

Work has been prosecuted nearly continuously on sections 1, 3 and 4 throughout the year. On Section 2 the contractors, George H. Breymann & Brothers, have, with the consent of the Board, assigned their contract to the Morris & Cumings Dredging Company, which has undertaken to complete the work by April 1, 1905.

The amount of material excavated from each section during the year, and the total amount excavated up to Dec. 1, 1903, is as follows:—

	Amount excavated from Dec. 1, 1902, to Dec. 1, 1903 (Cubic Yards).	Total Amount excavated to Dec. 1, 1903 (Cubic Yards).
Section 1,	232,793	403,447
Section 2,	76,631	188,146
Section 3,	391,030	406,357
Section 4,	391,188	404,993
Totals,	1,091,642	1,402,943

About six-tenths of sections 1, 3 and 4 have been excavated to a depth of 30 feet at mean low water, and about one-third of Section 2. These excavations have already materially increased the anchorage ground for deep-draft vessels.

The total amount expended on this project to Dec. 1, 1903, is \$198,591.66.

DREDGING IN BOSTON UPPER HARBOR.

The work of dredging a channel 27 feet deep through the bar at the confluence of Charles and Mystic rivers, under a contract with the New England Dredging Company which was in force at the date of the last report of the Board, was completed Feb. 2, 1903. This work was undertaken in consequence of complaints that vessels had grounded on shoals in this portion of the channel while approaching the docks at

Charlestown. Notwithstanding the area to be dredged is within the lines of the channel to be improved by the federal government, more speedy action was desirable for immediate relief, as the government work would not be advanced sufficiently to remove the objectionable shoals for several years.

In all, 104,101 cubic yards of material were excavated, and most of it carried to sea, while a small portion was used for filling the Commonwealth's flats at South Boston. The work was done at an expense of \$27,464.79, and paid for out of the income of the harbor compensation fund.

DORCHESTER BAY.

The work of dredging anchorage basins for yachts near the yacht landings on the southerly side of South Boston, under chapter 425 of the Acts of 1902 which authorizes an expenditure of \$100,000, has been prosecuted continuously during the year, except from June 15 to September 15, when work was suspended in order not to interfere with the occupation of the areas by yachts. The excavated material has nearly all been used in filling the Commonwealth's flats on the northerly side of South Boston, only a small amount being taken to sea.

A little more than one-half of the smaller area near K and L streets, and a little less than one-half of the larger area near O and Q streets, have been dredged, the smaller area having been excavated to the depth of 6 feet and the larger area to 9 feet at mean low water. During the year 219,410 cubic yards have been taken out, making the total amount excavated up to Dec. 1, 1903, 230,622 cubic yards. The amount expended to the same date is \$42,220.06.

DREDGING EASTERLY SHORE OF DORCHESTER.

By chapter 439 of the Acts of 1903 the Board was instructed to dredge a channel off the easterly shore of the Dorchester district in the city of Boston, and authorized to expend for the purposes of the act \$25,000. During the summer conference was had with representatives of the yacht clubs which are located in that vicinity, and in November a

survey of the territory between Savin Hill and Commercial Point was made, and is now being plotted. It is expected that plans will be completed and proposals advertised so that the dredging can be commenced early in the coming season.

The amount expended up to Dec. 1, 1903, is \$220.02.

DREDGING NORTHERLY SHORE OF QUINCY.

By chapter 366 of the Acts of 1903 the Board was instructed to dredge a channel off the northerly shore of Quincy, between Wollaston and Squantum, and authorized to expend \$7,500 therefor. A survey was made of the locality in July, and a conference had with representatives of the yacht clubs in that vicinity, and with the Metropolitan Park Commissioners who have acquired the shore front for a considerable distance on either side of the proposed channel. After this conference, plans were prepared for a channel 40 feet wide and 3 feet deep at mean low water, and about 2,300 feet long, extending from deep water up to a point abreast of the proposed location of the Wollaston Yacht Club house, whence a branch channel of the same depth and width, 370 feet long, is extended to the Squantum Yacht Club house.

Specifications have been prepared and proposals invited for the work, which is to be completed before the next yachting season.

The amount expended up to Dec. 1, 1903, is \$60.

WEYMOUTH FORE RIVER.

By chapter 440 of the Acts of 1903 the Board was directed to dredge the channel in Weymouth Fore River to a depth not exceeding 24 feet at mean low water, under an appropriation of \$25,000. The purpose of the desired improvement was to enlarge and deepen the channel from the Fore River bridge at Quincy Point to the deep water opposite Germantown.

In June and July a survey was made of this portion of the river, and estimates made for the excavation of a channel 200 feet wide and 18 feet deep at mean low water. After consultation and inquiry, it was found that the United States engineers had already prepared estimates to present to the

next Congress for a channel 300 feet wide and 18 feet deep, very nearly in the same location as the channel outlined by the Board. In case this work was carried out by the national government there would be no necessity for the work by the Commonwealth, and it was deemed advisable to defer further action.

Early in October the Fore River Ship and Engine Company requested the Board to excavate a channel 15 feet deep at mean low water and 200 feet wide, in a slightly different location from the original plans, but following the line of deepest water in the natural channel, in order that barges drawing 22 feet loaded with boilers too large for transportation by rail, and which were to be placed in vessels under construction at the company's works, might reach the wharves. After consideration, the Board decided to make the improvement as desired. The demand was pressing, and a channel of this size will answer the requirements of navigation on this river until the larger channel planned by the government shall be excavated. A contract was entered into on Oct. 16, 1903, with the Harries & Letteney Company, to excavate the channel forthwith, for the sum of 29½ cents per cubic yard, scow measurement.

The total amount expended to Dec. 1, 1903, is \$4,705.95.

WINTHROP CHANNEL.

Early in May a petition was received from the Winthrop Yacht Club and others, asking the Board to examine the channel at Winthrop, and improve its navigable condition by removing obstructions and by dredging, to obtain a uniform depth of not less than 8 feet at mean low water. A survey was made, and the obstructions were found to be caused by shoals formed by the washing down of the banks of the old channel and thus reducing its depth and width. It was originally 8 feet deep at mean low water and 50 feet wide. The flats through which it was dredged are composed of silt, which had gradually washed down and partially filled it in. The outer portion of the channel was found to be very little affected, but the inner portion, for a distance of about 1,000 feet, required dredging. Five thousand four

hundred and five cubic yards of material were excavated and deposited in the cove between Cottage Hill and Point Shirley, in July, at a cost of \$1,837.97, paid from the income of the harbor compensation fund. The channel has now practically its full depth of 8 feet and width of 50 feet from its entrance to the steamboat wharf. The improvement is a material benefit to navigation in that part of Winthrop.

The total amount expended by the Commonwealth on this channel since 1898 is \$3,916.62.

SHIRLEY GUT.

In May a survey was made of Shirley Gut. It disclosed that the dredging done during the past year had widened and deepened the northerly entrance to the Gut, also that a considerable amount of dredging had been done at the end of the wharf on the Deer Island side. The storms during the winter had built out the end of Point Shirley, but not to quite such an extent as in the previous year. In the spring it was found that the shore subjacent to the siphon of the metropolitan sewer on the Deer Island side of the Gut was washing away. Subsequently the Metropolitan Water and Sewerage Board placed riprap over and around the siphon, to prevent further wear.

In June and July 2,890 cubic yards of material were excavated from the end of Point Shirley where the material had been washed in during the previous winter, thereby widening the channel out to the lines to which it was excavated the previous year. This dredging was done without expense to the Commonwealth, as the material excavated had a value to the contractor more than equal to its cost. In order that dredging may be done in this locality from time to time, a taking was made on April 23, 1901, as reported in that year, of the end of Point Shirley, for which a claim for damages was filed in the superior court. On Oct. 12, 1903, a settlement was effected with the owner of the land taken, by the payment of \$400, and a release of title to so much of the land theretofore taken as was not needed to preserve the water-way.

The total amount expended during the year is \$452.

THE COMMONWEALTH FLATS AT SOUTH BOSTON.

The principal work on the Commonwealth flats has been filling the 26-acre lot east of the area leased to the Metropolitan Coal Company. A portion of this territory was the lot leased to the Boston Molasses Company in 1902. By the terms of the latter lease the area was to be filled to grade 14, and certain improvements made in order to fit the premises for the purposes intended. The work of paving and draining the approach to the premises from Summer Street and laying a drain through the property, which was under contract to Jones & Meehan at the date of the last report, has been completed in a satisfactory manner at an expense of \$6,186.29. The gravel filling necessary to prepare the roadway for the paving was furnished and placed by the New England Dredging Company at an expense of \$1,593.10.

On March 26 a contract was entered into with George H. Cavanagh to build about 650 feet of bulkhead on the easterly side of the lot, to retain the material used for filling. This structure was completed July 11, 1903, at a cost of \$5,763.10. The work of filling the enclosed area above the level at which material could be dumped directly from scows was shortly after commenced with an hydraulic dredge, and prosecuted continuously since that time. Up to Dec. 1, 1903, 369,672 cubic yards have been deposited above that grade. This work is being done under the contract for excavating Section 1 of the anchorage basin in Boston harbor.

Early in January complaint was received that ledge or other obstruction existed near the entrance to the artificial channel to the wharves and docks leased to the coal companies. An examination was made of the locality by sweeping, but no obstruction could be found. Later a small boulder on top of the bank on the westerly side of the channel was discovered by a diver. This was removed, as were also a number of stones lying on the slope of the bank. At the same time a pile of dimension granite stones was

found on the flats to the south-west of the reported obstruction, which had a few days before been struck by the screw of a tow boat, breaking off three of the blades. Nine large stones were removed from this locality also. The total cost of this work was \$220.

On March 2, 1903, the Board executed a lease from the Commonwealth to the Brown-Wales Company of a parcel of land next adjoining it on the Commonwealth's flats northeasterly of Egmont Street, containing 13,250 square feet. The lease is for a term of three years from March 2, 1903, at a yearly rental of \$750, with the right to purchase subsequently, if exercised within a year from its date.

On June 22, 1903, the Board, under the provisions of chapter 377 of the Acts of 1902, executed a license * to the Brown-Wales Company to lay and operate a track on C and Egmont streets. This license is the first one issued under the provisions of the act, and was duly accepted by the company within the time stipulated.

A plan of the Commonwealth's land at South Boston is printed herewith.

COMMONWEALTH PIER.

The Commonwealth pier at South Boston, built under chapter 513 of the Acts of 1897 and for which the sum of \$400,000 was provided, remains in the same condition as it was last year. The dock on the westerly side and the berth at the end have a depth of 30 feet at mean low water. On the easterly side the dock, not having been dredged, has a depth varying from 4 to 15 feet at mean low water.

There has been collected during the year and paid into the treasury of the Commonwealth to be credited to the Commonwealth's flats improvement fund the sum of \$7,464.40, received for the use of the dock on the westerly side of the pier and the berth at the end of the pier by vessels loaded with coal and sugar, for discharging their cargoes into lighters alongside.

During the year a small quantity of gravel for surfacing

* See Appendix B.

has been placed in about the centre of the pier, amounting to 627 cubic yards, at an expense of \$313.50. The total cost of this pier to Dec. 1, 1903, is \$370,401.95.

NORTHERN AVENUE AND BRIDGE.

The failure of the city of Boston to accept chapter 507 of the Acts of 1901, in relation to the laying out and construction of Northern Avenue, rendered further legislation requisite. Accordingly, chapter 381 of the Acts of 1903 was passed for laying out the avenue, as well as a side street named Sleeper Street, which connects Northern Avenue with Congress Street across the lands of the Boston Wharf Company and the New England Railroad.

Upon the passage of said act the Board forthwith, on June 4, filed in the registry of deeds for the county of Suffolk a copy of section 1 of the act, together with a duplicate plan described therein, signed by the commissioners, in accordance with the requirements of section 2, and gave notice thereof to the city of Boston, the railroad companies and the Boston Wharf Company.

The release from the Boston Wharf Company provided for in section 3 has been executed and delivered; that from the railroad companies is still awaited. The city engineer has located the streets on the ground, and is preparing all plans necessary for the construction of the same and of the bridge. It is anticipated that the construction work will be commenced early in the spring, and actively prosecuted to completion.

The statute provides that the construction of the avenue across the lands of the Commonwealth shall be done by the Board of Harbor and Land Commissioners, and this will be undertaken as soon as the other work is nearing completion.

The location of this avenue and bridge is shown on the plan of the Commonwealth's land at South Boston, printed herewith.

THE COMMONWEALTH'S FLATS AT EAST BOSTON.

No physical change in these flats has taken place since the last report. In the autumn the claim of Jeffries for damages for the taking by the Commonwealth, under chapter 486 of the Acts of 1897, was settled just before going to trial by the payment of \$100.

The claim of the East Boston Company has resolved itself into two questions: first, as to what portion of the flats taken is owned by the East Boston Company; second, what damage has the company suffered by the taking. The first question is being tried in the Court of Registration, and the evidence in support of the contention of the Commonwealth has been to a large extent supplied from the plans in this office and the testimony of the chief engineer of the Board. As the case is sharply contested on both sides, and there are many and various law points at issue, a final determination seems to be far distant. Meanwhile, the second of the above questions awaits the decision of the first; wherefore it is deemed inadvisable to recommend improvements of the flats whereby their physical condition might be materially changed, before the jury who must eventually pass on the question of damages shall have had an opportunity to take a view.

In response to an inquiry from the Legislature in January last with reference to plans for a State dock at East Boston, or suggestions relating thereto, the Board replied in part as follows:—

Replying to the fifth inquiry, the Board has considered it the part of wisdom to refrain from formulating plans for prospective improvement of the Commonwealth's land at East Boston until a decision in the East Boston case should finally determine the questions in litigation.

Chapter 486 of the Acts of 1897, "for the purpose of securing public ownership and control of certain portions of the foreshore of Boston harbor," authorized this Board to take certain land and flats within described limits in East Boston. An issue of bonds of \$100,000 was authorized for the expenses incurred under the act. Section 5 authorized the Board to excavate channels, fill the

flats and generally improve the land and flats taken, "upon such plans as it may deem best." The size of the appropriation indicated to the Board the purpose of the Legislature to acquire the foreshore and flats before they became valuable, and to develop the same at some future time, when the demands of commerce seemed to require such development and an adequate appropriation should be made therefor.

Plans have been considered in a very general way only. Several considerations, in the opinion of the Board, would prevent the forming of plans for improvement of that locality at present. The chief objection at present is the unsettled condition of the grade crossing question in East Boston. Until that is fully and finally determined, it would be unwise, in the opinion of the Board, to develop these flats, and premature to form plans. The Commonwealth should be slow to again build piers and docks in any locality until access thereto is assured. The pier and dock of the Commonwealth at South Boston, which was built at an expense of about \$400,000, has lain unused for several years, simply for lack of a proper avenue of approach. The pier may remain unused until the piles are destroyed, unless Northern Avenue bridge shall be constructed.

Therefore, under these circumstances, further consideration of plans for developing the front at East Boston have been held in abeyance.

The decision of the commission on the separation of grade crossings at East Boston, owing to the effect it may have upon the value of the Commonwealth's flats, is awaited with interest, inasmuch as convenient railroad connections at grade are an all-important consideration in any project of development.

The total amount expended on account of this property, up to Dec. 1, 1903, is \$22,945.36.

SOUTH BAY.

The work of dredging a channel in South Bay, under contract with John C. Cobb, was completed Jan. 1, 1903. In all, 152,975 cubic yards of material were excavated, making a channel 110 feet wide on the bottom and 12 feet deep at mean low water from Dover Street bridge up along the wharves in rear of Albany Street to the mouth of Roxbury

Canal; thence across the bay in front of the wharves recently constructed by the Roxbury Central Wharf Company. The material excavated was used for filling an area of flats in the bay.

Business is gradually extending in South Bay and occupying the wharves constructed during the last few years, the channel excavated as above described forming an ample approach.

The amount expended for the improvement of this bay to Dec. 1, 1903, from the fund created by chapter 278 of the Acts of 1898, is \$38,451.69.

ANNISQUAM RIVER.

A survey was made of Annisquam River, and estimates of the cost of improving the channel thereof, in accordance with the provisions of chapter 71 of the Resolves of 1903, the appropriation therefor being \$1,500.

Annisquam River flows into Ipswich Bay on the northerly side of Gloucester, and extends southerly across the Cape, one of its branches extending nearly into Gloucester harbor on the southerly side of the Cape. Over the bar at its outlet there is a depth of about 7 feet at mean low water, and the channel, with a depth of not less than 6 feet at mean low water, extends as far as Wolf Hill about $1\frac{1}{2}$ miles from Gloucester harbor at the cut, so called. Above Wolf Hill the channel runs nearly dry at low tide, and above the railroad bridge the bottom rises to about 2 feet above mean low water. From the river a cut or canal extends through the marshes and beach into Gloucester harbor. The river and cut, with Gloucester harbor, thus form the easterly portion of Gloucester and Rockport into an island, to which the only highway approach from the mainland is over a drawbridge which crosses the cut or canal at Western Avenue.

The Gloucester branch of the Boston & Maine Railroad crosses the river about three-quarters of a mile north of the highway bridge. These two bridges are the only ones connecting the island with the mainland.

The tides in the river flow to and from Ipswich Bay as

far up as a point about midway between the railroad bridge and the cut, while the tides in the cut and the upper portion of the river flow in and out from Gloucester harbor. The cut, or Gloucester canal, was first excavated by Rev. Richard Blynman about 1643, under authority of the town, who also built and maintained a drawbridge over the cut for land travel. This cut remained open until about 1704, when it was closed by a severe storm. From an examination of the town records of Gloucester it appears that a good deal of difficulty was encountered in maintaining the cut and caring for the drawbridge. The cut as made by Mr. Blynman was a comparatively small affair, suitable only for small boats or shallops, but was of great benefit to the early settlers. With the advent of steam it was anticipated that the cut would be of much more value, and the Gloucester Canal Company was organized under chapter 79 of the Acts of 1822. It constructed the canal or cut in substantially its present shape. The Commonwealth advanced about \$1,500. An appropriation of about \$6,000 was obtained from the federal government, and an equal amount was subscribed by individuals. Only one small steam vessel was ever known to have passed through the cut, and the use of it by other boats declined. A drawbridge was maintained for a few years, and finally gave place to a bridge with a fixed span.

In 1866 the proprietors of Wolf Hill, who had opened a quarry, were authorized by the town to reopen the canal, and a contract was made by the selectmen with the proprietors in 1867 to construct a drawbridge as ordered by the county commissioners. The canal was opened at this time, and a drawbridge has been maintained there ever since.

The river is now used during the summer by a fleet of pleasure boats, also to some extent by fishing boats, especially those bringing bait caught in Essex and Ipswich rivers and Ipswich Bay to the fishing fleet in Gloucester harbor. Many new fishing vessels built at Essex are brought through the river and cut to Gloucester to be fitted out.

The topographic survey of the shore line, extending from Gloucester harbor to the mouth of the river at Ipswich Bay, and soundings throughout its whole length, appear on the

plan herewith. From inquiries among people interested in the project at Gloucester, it seems that the desired improvement should be the excavation of a channel with a depth of not less than 6 feet at mean low water from the head of the present 6-foot channel through the cut into Gloucester harbor. This channel should be 100 feet wide on the bottom, with the necessary side slopes, from the end of the present 6-foot channel up to the entrance of the cut; thence 60 feet wide on the bottom, with the necessary side slopes, through the cut into Gloucester harbor.

It is said that before long the city will be obliged to rebuild the bridge over the cut, in order to enable it to safely carry the increasing traffic. The railroad formerly crossed the river on a long pile bridge, but a few years ago the larger part of the pile structure was filled solid, leaving an opening between the abutments of about 175 feet. This created so strong a current under the bridge that it was found necessary to riprap the bottom around the piles to protect it from scour. If the channel is improved as projected, it would probably be necessary to reconstruct the railroad bridge; and when this is done, the bottom under the fixed portion of the bridge should be excavated as well as the draw-way, in order to reduce the velocity of the current under the bridge.

Presumably the retaining walls on the sides of the present channel of the cut and under the highway bridge are laid on the sand and gravel bottom at about the level of low tide. If the 6-foot channel is excavated, it will be necessary to riprap the slopes of the cut in front of the wall on the westerly side, or possibly remove the wall, in which case the stones can be used to riprap the face of the sloping bank as left by the excavation. On the easterly side the wall will have to be wholly removed, and the stones forming this wall can be used in riprapping the face of the sloping bank as left by the excavation on that side. When the bridge is rebuilt, it should have a draw opening of not less than 40 feet.

No estimate of the cost of any changes in the railroad bridge or the city bridge has been made.

From the borings which were taken along the line of the

present cut and its approaches, and at points where from the surroundings ledge might be looked for, it appears that the excavation will be almost entirely in sand and gravel, with very little probability of striking any ledge.

In the section of the river where the proposed channel is to be excavated there are large areas of flats and marsh lying between the proposed channel and the high-water line; and it would seem that, as the material to be excavated is principally clean sand and gravel, it should be retained and used for filling these low areas. As the depth of the channel to be excavated is not great, it will be necessary to use small scows on the work, and these cannot be taken to sea in heavy weather; but if arrangements can be made for utilizing these flats, all the material to be excavated can be placed there without detriment to the river, and to the great advantage of the property. A portion of this material will undoubtedly have to be rehandled in order to place it in a compact manner, and this is allowed for in the estimate of cost of the work, assuming that no charge would be made by the owners of the flats. If the material through the cut or canal can be excavated by long boom clam shell dredges, it might be deposited on the banks of the canal, and if this can be done, the cost of the work may be considerably reduced.

The cost of excavating the channel as above outlined and riprapping the banks in the cut under the highway bridge would be as follows:—

	Cubic Yards.
Excavation from Wolf Hill to railroad bridge,	59,400
Through railroad bridge,	6,000
From railroad bridge to Gloucester harbor,	122,800
	<hr/>
	187,700 at 35 cents, \$65,695
Removing wall and riprapping bank on westerly side of cut,	900
Removing wall and riprapping bank on easterly side of cut,	1,700
	<hr/>
	\$68,295
Supervision and contingent expenses, 10 per cent.,	6,829
	<hr/>
	\$75,124

The amount expended from the appropriation is \$1,399.28.

The Board does not deem the advantages to the public to be commensurate with the cost of the improvement.

CONNECTICUT RIVER.

In December, 1902, the Board was informed that solid material was being dumped into the Connecticut River below high-water mark from the premises of manufacturing companies in Holyoke, in violation of chapter 96 of the Revised Laws; and the offending parties were notified to appear before the Board and show cause why the Attorney-General should not be directed to institute proceedings for creating a nuisance, in violation of statute. Subsequently proceedings were instituted by the Attorney-General, with the result that later an adjustment was effected.

In the spring of 1903 willow cuttings were set in the easterly bank just below the highway bridge between Hadley and Northampton, where it had been riprapped in front of the dike built the previous year. The expense was \$92.71.

After the spring freshets it was found that a section about 50 feet long in the protective works built at Hadley in 1889 needed repair, and also that in several places in the work done in 1900, at the foot of the graded bank, the riprap had been somewhat damaged. These places are being repaired by placing willow mats and stone riprap over the damaged areas, and planting large willow sticks or cuttings. The cost of the above work to Dec. 1, 1903, is \$1,112.51. The total amount expended at Hadley, up to Dec. 1, 1903, is \$57,909.80.

By chapter 82 of the Resolves of 1903 the Board was authorized to expend \$7,500 in protecting the westerly bank of the river in the town of Hatfield from further encroachment. In August an inspection of the locality was made, and conference held with the selectmen and owners of property along the river bank. It was found that protection by riprapping the banks as at Hadley was desired; but as the amount of money available was insufficient, it was decided, after an examination and discussion, to construct a dike running from the highway across the depression in the

meadows which runs along just back of the present highway in Hatfield, to the higher portions of the river bank and thence along the bank for a short distance, for the purpose of preventing the river from breaking through this depression, thereby cutting off a large section of the meadows and forming an island. This would effectually prevent the river from breaking through as feared, and could be done within the appropriation. Releases have been obtained from the owners of property on which the dike is to be located, for all claims for damages which may arise from its construction; but, owing to delays in getting these releases, it was decided to postpone construction until next spring.

The sum of \$165.10 has been expended in the preliminary work, from the appropriation of \$7,500.

In September an inspection was made of the manner in which the Turners Falls Lumber Company was using its privilege under a license from the Board for maintaining booms at Turners Falls, complaint having been made that at times this company did not afford sufficient passageway through the boom for river craft.

HARBOR OF REFUGE, QUICKS HOLE.

In pursuance of the requirements of chapter 25 of the Resolves of 1903, a preliminary examination was made in July as to the expediency of constructing a harbor of refuge for fishing boats and small yachts on the westerly side of Quicks Hole in the town of Gosnold, "by excavating a channel into the pond at the north-easterly end of Nashawena Island."

There are two ponds located at the north-easterly end of this island, with a swamp or marshy area lying between them. The most westerly one, having an area of about 25 acres as measured on the United States Coast Survey chart, is nearly surrounded by hills and sand dunes, and would form a well-protected harbor. The shortest distance between the pond and Quicks Hole is about 300 feet, a high sand dune separating the two bodies of water. The surface of the pond is at substantially the same elevation as high water in the Hole, and the depth of water in the pond does not

exceed $4\frac{1}{2}$ to 5 feet. The mean rise and fall of the tide at this point is about 3.7 feet, and if a cut suitable for the passage of boats should be made from the pond into the Hole, the pond would be drained nearly dry at low tide.

The easterly pond, having an area of about 45 acres as measured on the United States Coast Survey chart, is separated from the Hole by a narrow gravel bank, which would not offer as great a protection to boats anchored within it as the sand dunes and hills surrounding the westerly pond. The surface of the water in this pond is at practically the same elevation as in the westerly pond, but the depth of water is a few inches greater; however, if a cut should be made into this pond suitable for the passage of boats, it also would be practically drained dry at low tide.

In view of the above facts, it would be necessary to excavate the entire area which is required for an anchorage basin and make the necessary entrance from the Hole into the pond, in order to provide a harbor of refuge in this locality for fishing boats.

From these ascertained facts it was not deemed expedient either to make a survey, or an estimate of the cost of a harbor of refuge at this place.

No expenditure was made from the appropriation of \$500 allowed by the above resolve.

STAGE HARBOR.

By chapter 47 of the Resolves of 1903 the Board was authorized to build structures in the breach at the eastern end of Stage harbor in Chatham for the protection of the harbor from encroachments or damage by the sea, and for that purpose the sum of \$5,000 was appropriated. An examination and survey was made of the locality early in May, and it was found that a channel had been cut by the sea across the marsh, so that the flood current from the sea flowed through the breach into the eastern end of the harbor, and was washing into it large quantities of sand, and filling that portion of it.

Owing to the difference of time and elevation of high tide in the sea to the eastward of Chatham and in Stage har-

bor, the current flows almost continuously from the sea into the harbor. At the eastern end of the cut the channel is practically bare at low water, and is used as a ford by people passing to and from Monomoy Island.

Plans were prepared and proposals invited for the construction of a timber dike extending from the sand dunes on the northerly side of the breach to the dunes on the southerly side, and also for building lighter timber structures to close three gaps which extended through the sand dunes on the southerly side of the breach down to the level of the marsh. But one proposal was received, and that being 50 per cent. greater than the appropriation, it was rejected.

The total amount expended up to Dec. 1, 1903, is \$117.69.

APPONAGANSETT HARBOR.

The work of constructing the breakwater at the mouth of Apponagansett harbor, as authorized by chapter 509 of the Acts of 1902, under contract with E. S. Belden & Sons, has been completed. The breakwater is 690 feet long, and protects a large area of the harbor, making a much safer anchorage for yachts and other small craft. In all, 27,238 tons of stone were placed in the breakwater.

After examining the rocks which were reported as obstructions in various portions of the harbor, it was finally decided that, as they appeared to be of large dimensions and would probably be very expensive to remove, it would be better to mark the most dangerous one by an iron spindle, which was furnished and erected at an expense of \$447.50. Two other dangerous rocks are marked by a government buoy.

The use of the harbor has increased, and in the heavy gales of this year its efficiency and value as a shelter has been proved.

The total amount appropriated for this improvement is \$30,500. The amount expended up to Dec. 1, 1903, is \$30,331.82.

NANTUCKET HARBOR.

On May 14, 1903, an arrangement was made with George W. Townsend to remove certain rocks in Nantucket harbor, in accordance with a request made in the previous year by

the selectmen. Three large rocks were blown up, and the pieces taken for use in the government breakwater. One lay nearly in the middle and two near the side of the channel. The amount of work was found to be much larger than anticipated from representations made by the petitioners. In all, 100 tons of rock were broken up and deposited on the shore at Coatue Point, at an expense of \$1,043.50.

SCITUATE.

Under authority of chapter 434 of the Acts of 1900, for the protection of the shores and harbor of Scituate which were damaged by the sea, walls of concrete were constructed at the Sand Hills on the northerly side of Scituate harbor in 1900, and in 1902 along the crest of the beach lying between Damon's Island and the Glades at North Scituate. They satisfactorily answer the purpose for which they were intended.

On March 10, 1903, the selectmen called attention to the condition of the beach and highway between the first and second cliffs on the southerly side of Scituate harbor, and asked that a wall be built along the crest of that beach, to protect the highway in its rear. In May the Board made an examination, and in August a survey of the locality and estimate of cost of the proposed wall. In September the selectmen were informed that the estimated cost of the wall would be \$6,050, while the balance of the appropriation of \$15,000 made by the act was only \$2,810.97; and that, whenever the town would provide the balance necessary to complete the work, the Board would be ready to undertake it. A copy of a vote passed by the town Oct. 30, 1903, appropriating \$3,239.03 towards defraying the cost of building the desired wall, has recently been received.

The total amount expended at Scituate since the passage of chapter 434 of the Acts of 1900, is \$12,243.16:

EAST BAY, OSTERVILLE.

The project of opening a new channel for the passage of vessels from Nantucket or Vineyard Sound into East Bay at Osterville in the town of Barnstable, under chapter 96 of the Resolves of 1899, was investigated by the Board.

and a report made to the Legislature that the project was feasible, but that the opening should be protected by jetties in order to maintain the channel at the desired depth, and that the least cost would be \$42,500. This was deemed prohibitory of the enterprise.

By chapter 102 of the Resolves of 1901 the Board was required to make further examination, with a view to diminishing the cost of the project.

It reported that no substantial diminution of cost could be expected without materially changing the character and dimensions of the proposed entrance.

By chapter 376 of the Acts of 1903 the Board was authorized to construct an entrance into East Bay, and the sum of \$6,500 was appropriated to defray the expense thereof. Early in August, in pursuance of the act of 1903, an examination was made by the engineer, and it was found that the outer beach had washed away to a considerable extent, and the main outlet had moved about 1,200 feet to the westward. The tidal currents at the present time are maintaining a channel through the inner portion of the beach approximately 200 feet wide between the high-water lines, and 3 to 4 feet deep through the middle, except at the bend, where it is somewhat deeper. The best location for a navigable entrance was found to be in the same place as reported in 1899. With the appropriation available it is utterly impossible to make a channel of the dimensions originally planned. All that can be hoped for is to make a shallow cut and build short jetties on either side of the outer end sufficient to prevent the sand on the upper portion of the shore from washing into the cut, and to riprap the banks of the cut to such an extent as would force the current to scour out the bottom of the channel, and prevent it from washing away the banks.

A plan for a new entrance was made, which provides for excavating a channel through the upper portion of the beach down to low-water mark, riprapping the sides of this channel with stone largely obtained from the adjacent beaches, and building two short stone jetties on the outer beach to protect the entrance, relying on the current due to

the ebb and flood tides to scour out the channel to a greater depth.

In addition to the foregoing, it will be necessary to close the existing outlet artificially by building a dike or dam across it. The Board decided that it would not be advisable to attempt the work unless all the money available could be applied to opening the new cut and building the protecting jetties and riprap. After consulting with the parties interested in the improvement, they were informed that, if the expense of closing the old outlet in a manner satisfactory to the Board were not to be a charge upon the Commonwealth, it might be advisable to proceed with the work. Subsequently assurances were received from local contractors that they would undertake the work of constructing the new outlet and also closing the old one for the appropriation. Before contracting for the work, the Board requested the owners of the beach to release to it any claim for damages arising from the construction of the new outlet at the proposed location. Upon receipt of the desired releases immediate action will be taken in furtherance of the project.

WEST BAY, OSTERVILLE.

The work of excavating a channel through West Bay, at Osterville, under authority of chapter 491 of the Acts of 1902, has been satisfactorily completed. In all, 22,077 cubic yards of material have been excavated, under contract with John H. Gerrish, dated Aug. 8, 1902, at an expense of \$7,064.64.

The channel from the jetties to the deep water of the bay has now a width of not less than 100 feet, and through the higher portion of the shoal of 150 feet, with a depth of not less than 4 feet at mean low water throughout. The jetties are in a fair state of repair, but, owing to the eating of the planks by worms, some were broken off by the sea and had to be replaced.

The total amount expended at West Bay up to Dec. 1, 1903, is \$28,626.95.

LAKE ANTHONY.

The only work done at Lake Anthony in Cottage City during the year was the removal of a large boulder just beyond the outer end of the wharf on the north-western side of the lake. This was accomplished on June 9 and 10, at an expense of \$204.01.

The harbor master, without expense to the Commonwealth, took up, painted and replaced during the year all the buoys which had been set for moorings, and they are now in good condition. He estimates that an average of 75 yachts daily entered and cleared this harbor in July and August last, not including, however, about 25 yachts which made a home port there, many of which during the autumn were engaged in mackerel fishing.

The total amount expended at Lake Anthony up to Dec. 1, 1903, is \$26,836.28.

MENAMSHA INLET.

Early in June an examination and survey was made of the channel and jetties at Menamsha Inlet on the boundary line between Gay Head and Chilmark. But little change had taken place in the channel, as the work done during the previous year on the western jetty had effectually stopped the washing of sand through it, except at two small holes, which have since been stopped with pebbles and gravel.

Chapter 394 of the Acts of 1903 appropriated \$10,000 for straightening the channel above the jetties by dredging a new one across the flats up as far as the old stone wharf at the foot of the road leading to Vineyard Haven. Plans and estimates for this work were prepared, and on July 28, 1903, a contract was entered into with John H. Gerrish for dredging the channel 75 feet wide on the bottom, 5 feet deep at mean low water and about 1,600 feet long from the sound between the jetties and across the flats to the present channel opposite the old wharf, for the sum of \$8,250, the material to be placed on the banks well back from the sides of the excavation. This work was satisfactorily completed Oct. 12, 1903.

In order to prevent the current from cutting away the banks of the new channel at the turn near the old wharf, and the waves from washing down the banks just above the jetties, about 700 tons of stone were purchased and placed as riprap to protect the banks at these places. The stone was furnished by Daniel H. Flanders at \$1.10 per ton, delivered on the bank of the creek near the old wharf. The work of placing it along the banks of the channel was done by day labor. In addition to this, a timber fence about 80 feet long was built along the crest of the beach to close the gap in the wing of the eastern jetty, which was broken through by the sea three years ago. This fence was built to hold the crest of the beach in its present position by preventing the sea from pushing it over further inland. The total cost of this work amounts to \$1,673.42.

It is still unsettled what shape the excavated channel will finally take, for the waves during each high wind are washing down the banks, and the current flowing out from Menamsha Pond is carrying down considerable quantities of sand from the flats lying between the pond and the head of the channel.

The channel in its present condition forms a safe refuge for fishing boats and yachts, and already large numbers have made it a harbor over night while engaged in fishing in the sound near by. An account has been kept by the inspector on the work since September 24, giving the number of boats which came into the inlet for a harbor each night, the average in 44 days being 14 boats a day; on October 15, however, as many as 45 sought anchorage there. During this time two storms occurred, which prevented the boats from going out for a number of days, the duration of these storms being from October 9 to 13 inclusive, and from November 5 to 6.

The total amount expended at Menamsha Inlet up to Dec. 1, 1903, is \$17,739.18.

BASS RIVER AT SOUTH YARMOUTH.

Early in the spring a survey was made of the mouth of Bass River at South Yarmouth, to determine what changes had taken place since the construction of the jetties and

excavation of a portion of the outlet made the previous year, under the provisions of chapter 113 of the Resolves of 1901. The jetties were constructed of oak piles and spruce timber, and it was found that the sea worms already had attacked the spruce sheet piling, so that it was necessary at once to provide some method of protecting it from further injury. The current in the river had scoured and enlarged the channel which had been excavated, and its location at the same time had somewhat changed. On the whole, the channel was in a better navigable condition than when it was left on the completion of the work in the fall.

By reason of the insufficiency of the appropriation made in 1901, the Board was unable to excavate the channel the whole distance across the flats at the entrance to the river. By chapter 46 of the Resolves of 1903 an additional appropriation of \$15,000 was granted, to complete the improvement of the channel of the river.

Plans were prepared for excavating a channel 100 feet wide on the bottom through the flats from the deep water between the jetties to the deep water in the sound, a distance of about 1,700 feet. It was planned to have the excavated material removed and deposited in deep water about 1 mile south of the mouth of the river; but no proposals were received in response to the advertisements of the Board. Subsequently, a contract was entered into with John H. Gerrish to excavate the channel and deposit the material on the banks at a considerable distance back from the sides of the channel for the sum of \$6,500. From observations made since the completion of the work, there promises to be a good permanent channel of approach across the flats.

For the purpose of protecting the sheet piling of the jetties from just above low-water mark down to the sand, or, in cases where the water was very deep alongside the jetties, to a depth of 3 to 4 feet below low water, a protective covering of 1-inch boards, which had been previously treated with creosote in the proportions of 10 pounds to the cubic foot, were spiked to the sheet piling. Between the sheet piling and the boards there was placed a layer of tar paper,

to more effectually prevent worms from attacking the piles. Where the water was very deep alongside the jetty, bags filled with sand were deposited to form a bank close to the timber work. These sand banks were brought up to meet and lap on to the creosoted boards, so that now the whole length of both jetties, comprising about $\frac{3}{4}$ of a mile, is protected from the action of worms.

The cost of the work done during the year, including the survey made in the spring, amounts to \$8,186. The total amount expended in improving the entrance to Bass River up to Dec. 1, 1903, is \$31,292.86.

BASS RIVER, BEVERLY.

By chapter 341 of the Acts of 1903 the Board was directed to dredge a channel in Bass River at Beverly from Danvers River to a point near Elliott Street, — a distance of considerably over a mile, — 18 feet deep at mean high water, and 100 feet wide wherever practicable. An appropriation of \$25,000 was made by the Commonwealth for doing the work, the statute providing that any greater expense incurred shall be paid by the city of Beverly.

In June and August a survey of the river was made, and borings taken to determine the location and extent of the ledges which projected above the grade of the proposed channel, and estimates made of the cost of the work.

The existing low-water channel is quite tortuous, but in order to reduce the expense the proposed channel has been located as nearly as possible on its present line, departing from it only so much as is necessary to give a reasonably straight course through which large vessels can be safely navigated.

There does not appear to be any rock which will interfere with the excavation of the channel except at one point, where for a distance of about 150 feet a ledge crosses it, and projects from 1 to 6 feet above the proposed bottom.

The project contemplates a channel 100 feet wide on the bottom throughout, and 9 feet deep at mean low water, being equivalent to 18 feet deep at mean high water. Through the rock section it is proposed to reduce the width to 75 feet.

The location of the channel has been determined, and the cost of the work estimated at about \$85,000. The excess above the \$25,000 appropriated by the Legislature is to be paid by the city of Beverly. Plans and estimates were submitted to the mayor, and arrangements under the provisions of section 5 of the act made, whereby the city treasurer will promptly honor the requisitions of the Board for sums as needed.

Specifications have been prepared for publication, and proposals will be received Dec. 24, 1903.

The total amount expended up to Dec. 1, 1903, is \$618.75.

ISLANDS IN GREAT PONDS.

As the tendency of the urban population to find summer homes in the country increases, so hitherto unknown and comparatively worthless real estate becomes valuable.

To that description may be referred some of the islands in great ponds of the Commonwealth, of which the ownership is uncertain. Several of these were occupied by squatters, claiming title and denying the ownership of the Commonwealth. In a number of instances suits have been brought by the Attorney-General, at the request of the Board, the results of which will doubtless appear in his report.

On petition of Lyman R. Eddy, filed Aug. 19, 1902, for registration of title to Goat Island in Lake Chargoggagoggmanchaugagoggagungamaug, a great pond in the town of Webster, a good title was found by the court in the petitioner, and, on Feb. 17, 1903, a decree for registration ordered subject to any existing public rights between high and low water mark.

Under our form of government, while all private property is held subject to be taken whenever the public welfare so demands, all real estate should be open to private purchase and occupancy except such as is reserved for special purpose or public use. When reserved for public use, it should be so cared for as to prevent its becoming a nuisance.

Would it not be well for such islands as belong to the Commonwealth, because of no record of grant either to individuals or to the township in which they are located, and

for which no public use has arisen, to be open to the occupation and enjoyment or acquisition of those having need therefor, and be disposed of by lease or sale? There seems to be no sufficient reason for suggesting leasing the islands except possibly in some rare and special instances.

In the case of Grape Island in Lake Winthrop in Holliston, application was made by certain individuals to lease it. Upon investigation, it was learned that the use to be made was likely to prove a nuisance. Leasing to the individuals was objected to by the cemetery association which held property on the adjacent mainland, and by the selectmen of the town, who requested that, if leased at all, it should be to the cemetery association. This request seemed to be in the interest of quiet and good behavior, and the Board granted a license to the cemetery association to control and occupy this island, terminable at will.

Another unused land interest has arisen the past year, which it seems to be the duty of this Board to care for. On the decease of Franklin H. Bishop of Russell, and proof of his will in the probate court for Hampden County, it appears that he gave to the Commonwealth about \$10,000 worth of personal estate, and two certain parcels of land in the town of Russell, bordering on Russell Pond and comprising 2 acres, more or less, appraised at \$50. Application has been made to purchase these lots, but the Board is in doubt as to its right to dispose of them without the authority of the Legislature.

PROVINCE LANDS.

The work of transplanting grass, shrubs and trees, and the planting of pine seed, has been carried on during the past year on the Province Lands much in the same manner as heretofore.

The weather conditions during the summer were unusually poor, owing to the prevalence of a serious drought. As, however, most of the transplanting has been done since the middle of September, it is to be hoped that the work will not suffer. In all, about 25 acres were covered by the transplanting.

The result of the work of previous years shows gradual and decided improvement, the young pines and other trees, as well as the shrubs, exhibiting a vigorous and healthy growth.

The method adopted for the improvement of these lands has recently been confirmed by the report of a gentleman in high authority on the subject, as to similar works of reclamation carried on in Europe for more than half a century on substantially the same lines, where similar results have been reached. This confirmation encourages a belief that the improvement made is of the right character, and will be permanent.

The report * of the superintendent of these lands may be found in the Appendix. The amount received during the year for the use of portions of these lands is \$78.02.

The total amount expended by the Commonwealth on the Province Lands up to Dec. 1, 1903, is \$31,628.08.

TOWN BOUNDARY SURVEY.

The work of determining the location of town boundaries has continued with the same organization as for the past few years. Two field parties were employed during the working season from the first of April to the last of November. These parties have made the necessary surveys and obtained the information required in 58 cities and towns, located in Essex, Middlesex, Bristol and Worcester counties. A portion of the work accomplished was the survey of about 56 miles of roads and streams, forming boundaries between the various cities and towns.

In addition to the field work, the notes of surveys made in the previous year have been plotted, and the information procured has been put in proper shape for future record.

During the year atlases have been published covering the boundaries of 11 cities and towns, to wit, Boston, Brookline, Avon, Braintree, Canton, Holbrook, Hyde Park, Milton, Quincy, Randolph and Stoughton; and another atlas, covering 7 cities and towns, to wit, Belmont, Burlington,

* See Appendix C.

Cambridge, Lexington, Somerville, Waltham and Watertown, is now in the hands of the printer. One covering 6 cities and towns, to wit, Dedham, Dover, Needham, Newton, Wellesley and Westwood, has been prepared for the printer, and can be sent to him as soon as final action is taken on the straightening of one boundary line. Another atlas, covering 8 towns, to wit, Acton, Bedford, Concord, Lincoln, Maynard, Sudbury, Wayland and Weston, is in readiness for publication.

The plan of a portion of the boundary line between the towns of Braintree and Holbrook has been filed with the secretary of the Commonwealth, as required by chapter 149 of the Acts of 1903.

All the corners in the new town boundary lines established by the Legislature at its last session have been located, and the necessary stone monuments set by the town authorities to permanently mark the same.

During the year, after consulting with the town authorities, the Board submitted to 12 different towns, to wit, Boxford, North Andover, North Reading, Groveland, Middleton, Rowley, Ipswich, Hamilton, Andover, Essex, Newbury and West Newbury, for their concurrence, plans showing changes for straightening portions of the boundary lines. In most of these cases doubt existed as to the exact location of these lines, and some of the proposed changes are made in order that the lines may be properly defined and marked. After action by the towns in relation to the changes aforesaid the matter will be submitted to the Legislature in accordance with section 7 of chapter 25 of the Revised Laws.

The work of compiling the statutes relating to the establishment of the several town boundaries has been continued by the clerical force. Since the last report the court records from the year 1703 to 1765 have been examined, and all descriptions of town lines found therein have been copied for use in the preparation of the town boundary atlases.

In the preparation of atlases various improvements in the method of arranging information have been made, by which the cost has been somewhat reduced.

At the end of the season of 1903 the field work had been

substantially completed in that portion of the State east of Worcester County, except Barnstable and Dukes counties and two towns on the western border of Middlesex County; and the data relating to the boundaries of 71 of the 167 towns and cities within this area had been published.

SALE AND DISPOSITION OF MASSACHUSETTS ATLAS SHEETS AND TOWN BOUNDARY ATLASES.

There has been paid into the treasury of the Commonwealth during the year, under authority of chapter 57 of the Resolves of 1890 and chapter 360 of the Acts of 1900, the sum of \$175.35 received from the sale of Massachusetts atlas sheets and town boundary atlases. Under chapter 360 of the Acts of 1900 thirty-six town boundary atlases have been sent to the officers of the various cities and towns. Under chapter 95 of the Resolves of 1891 four topographical atlases have been gratuitously distributed.

WRECKS.

Complaints regarding wrecks have been received by the Board as follows:—

A scow adrift in Witchmere harbor, in Harwichport.

The schooner "D. Gifford" sunk at the entrance to Pigeon Cove harbor, in Rockport.

The barge "Keystone" lying sunken in Boston harbor, on the south-easterly side of Spectacle Island.

After examining the wrecks and notifying the owners, they were removed to places where they would cause no further obstruction.

The Board requested the United States authorities to remove the schooner "Charles W. Parker," wrecked in Boston harbor by collision.

No expenditure has been made during the year from the annual appropriation for the removal of wrecks.

INSPECTIONS MADE BY THE BOARD DURING THE YEAR.

1902.

- Dec. 29. Portion of South Bay near the New England Railroad bridge, where material was dumped.
- Dec. 30. Sea walls built by the Commonwealth at North Scituate, and at Stony Beach in Hull.

1903.

- Jan. 5. Wharf of Boston Tow Boat Company in East Boston, relative to removal of the portion built beyond the harbor line.
- Jan. 9. Wharves of Messrs. Richards, Stone and others on Mystic River.
- Jan. 28. Wreck of schooner "D. Gifford" at entrance to Pigeon Cove harbor, in Rockport; wharf of Littlefield & Plummer in Lynn harbor.
- Feb. 3. Wharves of Messrs. Stone and Richards on Mystic River.
- Feb. 10. Work in progress on the Commonwealth's flats at South Boston, and improvements made in South Bay.
- Feb. 11. Work done on jetties and channel in Bass River at South Yarmouth.
- Mar. 2. Wharves of Messrs. Stone and Richards on Mystic River.
- Mar. 9-11. Jetties at Witchmere harbor in Harwich; mouth of Herring River; jetties and channel in Bass River; East Bay in Osterville; Stage Harbor in Chatham, — in company with legislative committee.
- Mar. 26. Bass River in Beverly, in company with legislative committee.
- Mar. 27. Work in progress on the Commonwealth's flats at South Boston.
- Apr. 13. Dredging of channel in West Bay at Osterville.
- Apr. 14. Jetties and channel in Bass River at South Yarmouth.
- Apr. 23. Site of proposed work of the United Shoe Machinery Company on Bass River in Beverly.
- Apr. 24. Work of survey of Bass River at South Yarmouth.
- Apr. 25. Channel in West Bay at Osterville.
- Apr. 27-28. Work of survey at Stage harbor in Chatham, relative to protective work authorized by chapter 47 of the Resolves of 1903.

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1903.

- Apr. 29. Work in progress on the Commonwealth's flats at South Boston.
- May 9. Work done on breakwater in Apponagansett harbor at South Dartmouth.
- May 15. Wharf of the Condor Iron Foundry Company on Chelsea Creek in East Boston.
- May 18. Wharf of the United States Baking Company on Mystic River.
- May 21. Beach between the first and second cliffs in Scituate, relative to further work under appropriation by the Legislature.
- May 22-25. Removal of rocks from Nantucket harbor.
- June 1. Wharf in Lynn harbor adjoining property of People's Coal Company.
- June 1-3. Work done at Menamsha and Lake Anthony.
- June 12. Site of proposed work of the Old Colony Street Railway Company and Jerome C. Borden on Taunton River in Fall River.
- June 19-20. Channel in West Bay at Osterville, and jetties in Bass River at South Yarmouth.
- June 23. Site of proposed work of the Crystal Springs Ice Company on Merrimac River in West Newbury.
- June 26. Work in progress on the Commonwealth's flats at South Boston.
- June 27. Sea walls built by the Commonwealth at North Scituate and at Stony Beach in Hull.
- July 8. Annisquam River in Gloucester, relative to survey authorized by chapter 71 of the Resolves of 1903.
- July 9. Work in progress on the Province Lands in Provincetown.
- July 10. Site of protective work in Stage harbor at Chatham; East Bay and channel leading from mouth of Centreville River at Osterville, relative to channel authorized by chapter 376 of the Acts of 1903.
- July 11. Work in progress on Bass River at South Yarmouth.
- July 16. Ipswich and Plum Island rivers.
- July 23. Breakwater in Apponagansett harbor; ponds at the north-easterly end of Nashawena Island relative to a harbor of refuge on the westerly side of Quicks Hole, under authority of chapter 25 of the Resolves of 1903; work done at Menamsha; harbor and jetties at Lake Anthony.

1903.

- Aug. 3-5. Work in progress on Bass River at South Yarmouth, and in West Bay at Osterville.
- Aug. 7. Bank of the Connecticut River in Hatfield, relative to work authorized by chapter 82 of the Resolves of 1903; work done in North Hadley.
- Aug. 8. Wrecked barge "Keystone" in Boston harbor near Spectacle Island.
- Aug. 10. Work in progress on survey of Annisquam River.
- Aug. 11-12. East Bay at Osterville.
- Aug. 13. Work in progress on Bass River at South Yarmouth.
- Aug. 15. Work in progress on survey of Annisquam River.
- Aug. 20. Work of making borings in Bass River at Beverly, relative to dredging authorized by chapter 341 of the Acts of 1903.
- Aug. 21. Work in progress on Bass River at South Yarmouth.
- Aug. 22. Work in progress on the Province Lands in Provincetown.
- Aug. 27-28. Work of dredging outlet from Menamsha Pond, authorized by chapter 394 of the Acts of 1903.
- Aug. 31. Work in progress on Bass River at South Yarmouth.
- Sept. 4. Work in progress on survey of Annisquam River; site of proposed work of the Holyoke Water Power Company on Connecticut River in Holyoke; boom of the Turners Falls Lumber Company at Turners Falls.
- Sept. 8. John's Pond in Carver, relative to petition for license to draw water from this pond for flowing cranberry bogs.
- Sept. 10-11. Work in progress at West Bay in Osterville and on Bass River at South Yarmouth; work in progress on the Commonwealth's flats at South Boston.
- Sept. 17. Sites suggested for location of new drawbridge over Taunton Great River, authorized by chapter 462 of the Acts of 1903.
- Sept. 18. Town boundary survey work at Dunstable.
- Sept. 24-25. Work in progress at West Bay in Osterville and on Bass River at South Yarmouth.
- Oct. 1-2. Work in progress at Menamsha.
- Oct. 8-15. Work in progress at Menamsha.
- Oct. 16. South Bay and Commonwealth's flats at South Boston.
- Oct. 17. Site of proposed wharf of the Fall River Gas Works Company in Mount Hope Bay, Fall River.

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1903.

- Oct. 22. Work done on jetties at South Yarmouth.
- Oct. 23-24. Piers and docks in New York city.
- Oct. 28-29. Protective work on Connecticut River in Hadley.
- Nov. 3. Wharf of H. Frances Dunning on Mystic River in
Somerville; site of proposed work in Manchester
harbor.

LICENSES GRANTED DURING THE YEAR.

- Nos.
2688. Petition of the Boston & Northern Street Railway Company
for license to dump snow and ice into Mystic River from
Chelsea bridge. Granted Dec. 16, 1902.
- 2689. Petition of the Nantasket Beach Steamboat Company for
license to rebuild its wharf and build additions thereto,
on piles, on Weir River, in Hull. Granted Dec. 18,
1902.
- 2690. Petition of James Millar & Co. for license to build a bulk-
head and fill solid in a dock in Plymouth harbor, in
Plymouth. Granted Dec. 18, 1902.
- 2691. Petition of Ellis W. Harlow for license to build a bulkhead
and fill solid in a dock in Plymouth harbor, in Plymouth.
Granted Dec. 18, 1902.
- 2692. Petition of the city of Boston for license to repair its wharf
and build an addition thereto, on piles, at Rainsford
Island, in Boston harbor. Granted Dec. 18, 1902.
- 2693. Petition of the city of Boston for license to repair the
steamboat wharf at Deer Island, in Boston harbor.
Granted Dec. 18, 1902.
- 2694. Petition of the American Linen Company for license to
build a sea wall and fill solid on Taunton River, in Fall
River. Granted Dec. 18, 1902.
- 2695. Petition of the Fall River Iron Works Company for license
to build a sea wall and fill solid on Taunton River, in
Fall River. Granted Dec. 18, 1902.
- 2696. Petition of Robert D. Evans for license to build a sea wall
and fill solid at Beverly Cove, in Beverly. Granted Jan.
2, 1903.
- 2697. Petition of Henry W. Smith and Edwin G. Smith for license
to build a pile and timber boom on Chelsea Creek, in
Chelsea. Granted Jan. 2, 1903.
- 2698. Petition of Mary M. Gately for license to build a bulkhead
and pile platform, and fill solid, in South Bay, in Boston.
Granted Jan. 5, 1903.

- Nos.
2699. Petition of the Hamilton Woolen Company for license to build a pile wharf, pile fender and bulkhead, and to fill solid, on Powow River, in Amesbury. Granted Jan. 5, 1903.
2700. Petition of John Duff for license to extend his wharf, on piles, on Acushnet River at the westerly side of Fish Island, and to build a sea wall and fill solid in a dock on the south-easterly side of said island, in New Bedford. Granted Jan. 7, 1903.
2701. Petition of the Lynn Yacht Club for license to build a bulkhead and fill solid in Lynn harbor, in Lynn. Granted Jan. 7, 1903.
2702. Petition of Edward S. Tripp for license to build a bulkhead and fill solid in Lynn harbor, in Lynn. Granted Jan. 7, 1903.
2703. Petition of Nehemiah Lee for license to build a bulkhead and fill solid in Lynn harbor, in Lynn. Granted Jan. 7, 1903.
2704. Petition of Lester Leland for license to build and maintain a pier and float in Manchester harbor, in Manchester. Granted Jan. 9, 1903.
2705. Petition of the Northampton & Amherst Street Railway Company for license to lay a submarine cable across Connecticut River, in Hadley and Hatfield. Granted Jan. 28, 1903.
2706. Petition of the Standard Oil Company of New York for license to build bulkheads and pile platforms, fill solid and to dredge, on Chelsea Creek, at East Boston. Granted Jan. 28, 1903.
2707. Petition of Isaiah Spindell for license to build pile structures in Eel Pond, adjoining Water Street at Woods Hole, in Falmouth. Granted Jan. 30, 1903.
2708. Petition of the Hutchinson Lumber Company for license to build and maintain a wharf, in Lynn harbor, in Lynn. Granted Feb. 2, 1903.
2709. Petition of Joseph B. Breed and Henry W. Breed for license to build a bulkhead and pile platform, and fill solid, in Lynn harbor, in Lynn. Granted Feb. 2, 1903.
2710. Petition of Joanna R. Foster for license to build and maintain a pile platform at her wharf in Lynn harbor, in Lynn. Granted Feb. 2, 1903.
2711. Petition of the city of Boston for license to repair the piers at the East Boston landing of the north ferry, in Boston harbor. Granted Feb. 3, 1903.

- Nos.
2712. Petition of the New England Railroad Company, the New York, New Haven & Hartford Railroad Company, lessee, for license to widen the pile platforms on the easterly and westerly sides of its pier No. 2, South Boston freight terminals, in Boston harbor. Granted Feb. 3, 1903.
 2713. Petition of Lawler Bros. for license to fill solid, build a pile wharf and to dredge, on Chelsea Creek, in Chelsea. Granted Feb. 10, 1903.
 2714. Petition of Otis Foss for license to build a pile wharf in Lake Anthony, in Cottage City. Granted Feb. 10, 1903.
 2715. Petition of Charles H. Burns for license to build a bulkhead and fill solid on Mystic River, in Boston. Granted Feb. 18, 1903.
 2716. Petition of John B. Bugbee for license to build a bulkhead and fill solid on Mystic River, in Boston. Granted Feb. 18, 1903.
 2717. Petition of Francis W. Lawrence and Harry H. Wiggin for license to build a bulkhead and fill solid on Mystic River, in Boston. Granted Feb. 18, 1903.
 2718. Petition of the Boston Tow Boat Company for license to extend its south wharf, on piles, in Boston harbor, at East Boston. Granted Feb. 18, 1903.
 2719. Petition of the city of Boston for license to build a sea wall and fill solid on Roxbury Canal, in Boston. Granted Feb. 27, 1903.
 2720. Petition of Albert Watts for license to build a bulkhead and jetties, and fill solid in Boston harbor, in Winthrop. Granted March 19, 1903.
 2721. Petition of Jeremiah Green for license to build a bulkhead and pile wharf, to fill solid and dredge, on Belle Isle Inlet, in Winthrop. Granted March 19, 1903.
 2722. Petition of the trustees of the Wing's Neck Trust for license to build a breakwater and pile pier in Wing's Cove, and a wharf in Pocasset harbor, at Wing's Neck, in Bourne. Granted March 19, 1903.
 2723. Petition of Edward Canney for license to build a stone breakwater in Ipswich Bay at Lanesville, in Gloucester. Granted March 23, 1903.
 2724. Petition of Hanora O'Riorden, Jeremiah P. O'Riorden, Agnes C. Taft, Garrett J. O'Riorden and Michael S. O'Riorden for license to build a bulkhead, fill solid and maintain certain filling, on Mystic River, in Boston. Granted March 30, 1903.

Nos.

2725. Petition of James W. Austin, trustee, for license to build and maintain a wharf and float in Marion harbor, in Marion. Granted March 30, 1903.
2726. Petition of the South Bay Improvement Company for license to fill solid and maintain certain filling in South Bay, in Boston. Granted April 6, 1903.
2727. Petition of the Boston, Revere Beach & Lynn Railroad Company for license to build a pile structure and dolphins, to fill solid and dredge, in Boston harbor, at East Boston. Granted April 15, 1903.
2728. Petition of James H. Strong and Bernard W. Isfort for license to build a pile pier and to dredge in Broad Sound, in Revere. Granted April 17, 1903.
2729. Petition of Edward G. Frothingham for license to extend a building over Little River, in Haverhill. Granted April 17, 1903.
2730. Petition of the city of Boston for license to build a drop and drive piles in the easterly wharf at Long Island, in Boston harbor. Granted April 17, 1903.
2731. Petition of the Point Shirley Club for license to build and maintain a pile wharf and float in Boston harbor at Point Shirley, in Winthrop. Granted April 17, 1903.
2732. Petition of the Board of Metropolitan Park Commissioners for approval of plans for building a pile bridge over Malden River, in Everett and Medford, under authority of chapter 288 of the Acts of 1894. Granted April 24, 1903.
2733. Petition of the Old Colony Street Railway Company for license to build a sea wall, pile wharf and suction crib, and fill solid, on Weymouth Fore River and Town River at Quincy Point, in Quincy. Granted April 28, 1903.
2734. Petition of Almira A. Young for license to build and maintain a pile pier and float in the Mill Pond, in Chatham. Granted April 28, 1903.
2735. Petition of Clarence H. Collins for license to build a pile pier in Edgartown harbor, in Edgartown. Granted April 28, 1903.
2736. Petition of Isaiah Spindell for license to widen a portion of Bar Neck wharf, on piles, in Great harbor at Woods Hole, in Falmouth. Granted April 28, 1903.
2737. Petition of Alfred C. Harrison for license to build and maintain a sea wall and marine railway, and fill solid, in Little harbor at Woods Hole, in Falmouth. Granted April 28, 1903.

- Nos.
- 2738. Petition of Nicholas M. Sirovich for license to build a wharf in Hull Bay at Stony Beach, in Hull. Granted April 30, 1903.
 - 2739. Petition of the United Shoe Machinery Company for license to build and maintain dams, and fill solid on Bass River, in Beverly. Granted May 6, 1903.
 - 2740. Petition of the United Shoe Machinery Company for license to build a sea wall and fill solid on Bass River, in Beverly. Granted May 6, 1903.
 - 2741. Petition of the city of Boston for license to build a bulk-head and pile platform, and fill solid, on the south channel of Mystic River, in Boston. Granted May 8, 1903.
 - 2742. Petition of the Thomson-Houston Electric Company of Connecticut for license to widen its wharf, on piles, to lay and maintain pipes and fill solid on Saugus River, in Lynn. Granted May 13, 1903.
 - 2743. Petition of Frederic L. Felton for license to fill solid and maintain certain filling in Boston harbor, near the Reserved Channel, at South Boston. Granted May 19, 1903.
 - 2744. Petition of Delia P. Smith for license to build and maintain a wharf and float in Marion harbor, in Marion. Granted May 27, 1903.
 - 2745. Petition of David P. Kimball and L. Cushing Kimball, trustees, for license to build a pile wharf in South Bay, in Boston. Granted June 9, 1903.
 - 2746. Petition of Catherine A. Codman, Stephen R. H. Codman, Edmund D. Codman and Robert Codman, for license to build a pile wharf in South Bay, in Boston. Granted June 9, 1903.
 - 2747. Petition of Alvarado A. Coburn for license to build a wharf in Lake Quinsigamond, in Worcester. Granted June 22, 1903.
 - 2748. Petition of Hiram H. Ames for license to build a wharf in Lake Quinsigamond, in Worcester. Granted June 22, 1903.
 - 2749. Petition of Charles F. Ward for license to lay a cable across a portion of Chatham harbor at Nauset Beach, in Chatham. Granted June 22, 1903.
 - 2750. Petition of Paul Butler for license to extend his wharf, on piles, in Gloucester harbor, in Gloucester. Granted June 22, 1903.

Nos.

2751. Petition of Elwood G. Macomber, Isaac B. Macomber and Samuel Mercer for license to build a foot bridge, on piles, across a portion of Cole's River, in Swansea. Granted June 23, 1903.
2752. Petition of Eben D. Jordan for license to build and maintain a pier and float in Manchester harbor, in Manchester. Granted June 23, 1903.
2753. Petition of the Boston & Northern Street Railway Company for license to rebuild its wharf and extend the same, on piles, on Chelsea Creek, in Chelsea. Granted June 23, 1903.
2754. Petition of the Lynn Gas and Electric Company for license to build a sea wall and bulkhead, and fill solid, in Lynn harbor, in Lynn. Granted June 23, 1903.
2755. Petition of Charles C. Hanley for license to build a bulkhead, fill solid and dredge, on Town River, in Quincy. Granted June 24, 1903.
2756. Petition of Leonard Thompson for license to build a sea wall, construct a dolphin, fill solid and dredge, in Hingham harbor, in Hingham. Granted June 29, 1903.
2757. Petition of John Duff for license to extend his wharf, on piles, on Acushnet River, at the westerly side of Fish Island, in New Bedford. Granted June 29, 1903.
2758. Petition of John Duff for license to extend his wharf, on piles, on Acushnet River, at the easterly side of Fish Island, in New Bedford. Granted June 29, 1903.
2759. Petition of the city of Boston for license to drive piles and reconstruct its wharf on the southerly side of Gallop's Island, in Boston harbor. Granted June 30, 1903.
2760. Petition of Anna Bartlett Boynton and E. Moody Boynton for license to build an embankment, bulkheads, wharf and tide gates on Merrimac River, in West Newbury. Granted July 6, 1903.
2761. Petition of the city of New Bedford for license to build a pile and timber addition to its wharf on Acushnet River, at the foot of Union Street, in New Bedford. Granted July 8, 1903.
2762. Petition of Reed & Gamage for license to extend their wharf, on piles, in Gloucester harbor, in Gloucester. Granted July 8, 1903.
2763. Petition of the City Coal Company for license to widen its wharf by building a sea wall and filling solid on Acushnet River, in New Bedford. Granted July 8, 1903.

- Nos.
- 2764. Petition of William F. Nye for license to extend his wharf, partly solid and partly on piles, on Acushnet River at Fish Island, in New Bedford. Granted July 13, 1903.
 - 2765. Petition of the Metropolitan Water and Sewerage Board for approval of plans for laying two 36-inch sewer pipes across Mill Creek, in Chelsea and Revere, under authority of chapter 242 of the Acts of 1903. Granted July 14, 1903.
 - 2766. Petition of the city of Taunton for license to rebuild the bridge and draw-pier on Taunton River at Plain Street, in Taunton. Granted July 15, 1903.
 - 2767. Petition of the city of New Bedford for license to lay a 6-inch water pipe in Acushnet River from Fish Island to Pope's Island, in New Bedford. Granted July 16, 1903.
 - 2768. Petition of the United Shoe Machinery Company for license to build and maintain a dam on Bass River, in Beverly. Granted July 20, 1903.
 - 2769. Petition of the Edison Electric Illuminating Company of Boston for license to build structures, fill solid and dredge a channel in Boston harbor near the Reserved Channel, at South Boston. Granted July 20, 1903.
 - 2770. Petition of George B. Holbrook for license to build a pile pier in Hyannis harbor at Hyannisport, in Barnstable. Granted July 20, 1903.
 - 2771. Petition of Frederick Grinnell for license to build a pier, partly solid and partly on piles, and a stone breakwater, in Buzzards Bay, in Dartmouth. Granted July 20, 1903.
 - 2772. Petition of the J. M. Guffey Petroleum Company for license to build a wharf and bulkhead, and fill solid, in Beverly harbor, in Beverly. Granted July 20, 1903.
 - 2773. Petition of the Old Colony Street Railway Company for license to build a sea wall and fill solid in Mount Hope Bay, in Fall River. Granted July 29, 1903.
 - 2774. Petition of Joseph W. Stickney for license to build a bulkhead and fill solid on Chelsea Creek, in Chelsea. Granted July 30, 1903.
 - 2775. Petition of Augustus Hemenway for license to build and maintain a pile pier and float on Danvers River, in Beverly. Granted July 30, 1903.
 - 2776. Petition of Joseph B. Dickson, Jesse L. Eddy and Dana B. Cutter for license to drive piles on Mystic River, in Somerville. Granted July 30, 1903.

Nos.

2777. Petition of the Duplessis Shoe Machinery Company for license to build a sea wall and fill solid on Merrimac River, in Haverhill. Granted July 31, 1903.
2778. Petition of the Holyoke Water Power Company for license to erect a power station and excavate a race-way on the Connecticut River, in Holyoke. Granted Sept. 11, 1903.
2779. Petition of the Whitman Mills for license to build a bulk-head and fill solid on Acushnet River, in New Bedford. Granted Sept. 11, 1903.
2780. Petition of the Massachusetts Pipe Line Gas Company for approval of plans for driving piles and laying a siphon in Chelsea Creek at Chelsea Street bridge, in Boston and Chelsea, under authority of chapter 537 of the Acts of 1896. Granted Sept. 16, 1903.
2781. Petition of Thomas E. Reed for license to build a pile wharf in Massachusetts Bay at Cape Hedge near the easterly end of Long Beach, in Rockport. Granted Sept. 18, 1903.
2782. Petition of the Squantum Yacht Club for license to build and maintain a pile wharf, two dolphins and floats in Quincy Bay, in Quincy. Granted Sept. 21, 1903.
2783. Petition of Sylvanus Smith for license to extend his wharf, on piles, in Gloucester harbor, in Gloucester. Granted Sept. 21, 1903.
2784. Petition of the Butchers Slaughtering and Melting Association for license to build a pile wharf on Charles River at Brighton, in Boston. Granted Sept. 22, 1903.
2785. Petition of the New England Pottery Company for license to maintain certain filling and build a pile wharf on Chelsea Creek, at East Boston. Granted Sept. 22, 1903.
2786. Petition of the Hartford & Worcester Street Railway Company for license to fill solid and construct an embankment in Wales Pond, in Wales. Granted Sept. 24, 1903.
2787. Petition of the Hartford & Worcester Street Railway Company for license to build a trestle and fill solid in Wales Pond, in Wales. Granted Sept. 24, 1903.
2788. Petition of the trustees of the White Head Association for license to build and maintain a pile wharf on Weir River, in Hull. Granted Sept. 24, 1903.
2789. Petition of Job Churchill for license to build a dike and flume and draw water from John's Pond, in Carver. Granted Sept. 24, 1903.

- Nos.
- 2790. Petition of the Metropolitan Steamship Company for license to build a sea wall and pile structure in Boston harbor at Union wharf, in Boston. Granted Sept. 28, 1903.
 - 2791. Petition of Harry E. Converse for license to extend his wharf, partly solid and partly on piles, and to dredge, in Marion harbor at Charles Neck, in Marion. Granted Sept. 29, 1903.
 - 2792. Petition of the Standard Oil Company of New York for license to repair its wharf and build two dolphins on Merrimac River, in Salisbury. Granted Oct. 5, 1903.
 - 2793. Petition of Paul R. Eames for license to build an addition to his wharf on Ipswich River, in Ipswich. Granted Oct. 5, 1903.
 - 2794. Petition of the county commissioners of Essex County for approval of plans for relocating and reconstructing the present causeway across Waters River at Hussey's Mill, in Danvers, under authority of chapter 388 of the Acts of 1903. Granted Oct. 6, 1903.
 - 2795. Petition of the city of Boston for license to build a bulkhead and fill solid in the south channel of Mystic River, in Boston. Granted Oct. 14, 1903.
 - 2796. Petition of the John Morrison Company for license to repair its wharf, build a new wharf and to dredge, in Boston harbor, at East Boston. Granted Oct. 20, 1903.
 - 2797. Petition of Everett Joy for license to build a bulkhead, pile platform and wharf, and fill solid in Lake Anthony, in Cottage City. Granted Oct. 27, 1903.
 - 2798. Petition of the Fall River Gas Works Company for license to build a wharf in Mount Hope Bay, in Fall River. Granted Oct. 27, 1903.
 - 2799. Petition of the Metropolitan Park Commissioners for license to fill solid on Charles River near North Harvard Street, in Boston. Granted Oct. 30, 1903.
 - 2800. Petition of the New England Telephone and Telegraph Company of Massachusetts for license to lay and maintain a cable under and across the draw-way in Wellington bridge on Mystic River, in Somerville and Medford. Granted Oct. 30, 1903.
 - 2801. Petition of Lewis & Lord for license to build timber boatways in Salem harbor at their wharf, in Salem. Granted Nov. 3, 1903.
 - 2802. Petition of Francis W. Lawrence and Harry H. Wiggin for license to build a bulkhead and fill solid on Mystic River, in Boston. Granted Nov. 6, 1903.

Nos.

2803. Petition of the Railroad Wharf and Storage Company for license to build a bulkhead and fill solid on Mystic River, in Boston. Granted Nov. 6, 1903.
2804. Petition of Charles M. Hinkle, Thomas T. Gaff and Gordon Shillito for license to build and maintain boat-ways on Centreville River at Osterville, in Barnstable. Granted Nov. 9, 1903.
2805. Petition of the Walworth Manufacturing Company for license to extend its wharf, partly solid and partly on piles, in Boston harbor near the Reserved Channel, at South Boston. Granted Nov. 17, 1903.
2806. Petition of the Boston Elevated Railway Company for license to dump snow and ice into tide waters. Granted Nov. 23, 1903.
2807. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River from the yard of the Fitchburg Railroad Company at the foot of Haverhill Street, in Boston. Granted Nov. 24, 1903.
2808. Petition of the city of Boston for license to repair its north-west wharf at Long Island, in Boston harbor. Granted Nov. 25, 1903.

PETITIONS DENIED.

In December, 1902, a hearing was given on petitions of Horace B. Maglathlin and Sarah A. Hammond for licenses to maintain flumes and draw water from Silver Lake, in Halifax. It appearing that the Legislature has authorized, by chapter 356 of the Acts of 1899, and other statutes, the taking of water from this lake for domestic purposes, the petitioners were given leave to withdraw.

On Dec. 31, 1902, a petition was received from Olofus L. Gonyon for license to build and maintain a wharf in Lake Anthony, in Cottage City. This petition was opposed by owners of adjoining property on grounds satisfactory to the Board, and the petitioner was given leave to withdraw.

On Feb. 13, 1903, the petition of Clara T. Perkins for license to widen a wharf, on piles, in Gloucester harbor, was considered, and inasmuch as the proposed work would inadvisably curtail the dock area in that portion of the harbor, the petitioner was given leave to withdraw.

On March 24 the Board refused to grant permission to F.

H. Williams to remove material from the outside beach near the foot of Q Street at Point Allerton, in Hull, because the provisions of chapter 45 of the Acts of 1864 prohibit the removal of material from this portion of the beaches in Hull.

For the same reason on April 17 the Board refused to grant permission to George A. Barron to remove material from Ocean Beach near Bayside Station.

On July 6 the Board refused to grant the city of New Bedford authority to dump dredged material upon Egg Island shoals in New Bedford harbor, as the material would necessarily be of an objectionable nature, and, in the opinion of the selectmen of Fairhaven, would be liable to create a nuisance if dumped in the locality desired.

On July 22 the Board dismissed the petition of Messrs. Puffer and Perkins for revocation of license granted by the Board July 18, 1901, to Alice V. McAloon to build a wharf in Buzzards Bay in the town of Wareham, as a favorable decision would involve a question of title to land not raised at the hearing on her original petition.

On September 9 the Board refused to grant a license on the petition of James Chalifour for authority to build a sea wall and do certain filling in Salem harbor, as it appeared that the petitioner was not the owner of the land on which a portion of the wall was to be built.

On September 14 the petition of Charles L. Gifford for license to build a bridge across Santuit River was dismissed, because it was beyond the jurisdiction of the Board to license a bridge structure in the locality desired.

On September 18 the Board declined to lease Grape Island in Lake Winthrop, Holliston, to the petitioner, J. H. Grady.

On October 21 the Board heard the petition of Ezold Brothers for license to construct a building and boat landing in and over Pequot Lake, a great pond in Westfield. The granting of this license was opposed by the selectmen of the town of Westfield and by the Woronoco Street Railway Company, on the ground that the ordinary high-water mark of the lake at this point lies within the location of the highway adjoining the lake; that the petitioners' upland did

not border on the lake; that a boat landing located as desired would be dangerous, as it could not be reached without crossing the present line of electric car tracks; and that a steep embankment several feet high, on top of which the car tracks are laid, without space for a sidewalk on the pond side, must be descended or ascended to and from the proposed landing. The petitioner was given leave to withdraw.

MISCELLANEOUS PERMITS GRANTED DURING THE YEAR.

ISAAC BLAIR & Co., to dump snow from Dover Street bridge into tide water, in Boston. Granted Dec. 26, 1902.

ELIZABETH A. HICKEY, to remove material from the beach at North Scituate. Granted Jan. 9, 1903.

A. A. ELSTON & Co., to dump snow from Federal Street bridge into Fort Point Channel, in Boston. Granted Feb. 18, 1903.

JOSEPH L. BOARDMAN, to remove gravel from Salter's Beach, in Plymouth. Granted March 18, 1903.

WILLIAM B. BIRD, to remove gravel from the beach lying between Crow Point and Jarvis Avenue, in Hingham. Granted March 30, 1903.

TRUSTEES OF THE MAIN STREET LAND TRUST, to dredge material from their flats in Charles River, on the Cambridge side of the channel, near Cambridge bridge. Granted April 8, 1903.

JOAQUIN K. FERREIRA, to use and occupy Quarantine Rock, in Boston harbor. Granted April 15, 1903.

CITY OF BOSTON, to lay a water pipe in a way leading from Summer Street on the Commonwealth's flats at South Boston. Granted April 17, 1903.

NANTASKET BEACH STEAMBOAT COMPANY, to drive piles and construct and maintain dolphins in Weir River, in Hull. Granted May 4, 1903.

ALBERT J. WEST, to remove a portion of the bar extending easterly from the east end of Park Island, in Hull Bay. Granted May 5, 1903.

FRANK J. HANNON, to use for storage purposes a frontage of the sea wall on the northerly side of the Reserved Channel, on the Commonwealth's flats at South Boston. Granted June 15, 1903.

GEORGE B. ROBERTS and ELMER H. BRIGHT, to dredge their flats in Charles River adjoining the parkway, in Cambridge. Granted June 19, 1903.

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BROWN-WALES COMPANY, to lay and operate a railroad track in C and Egmont streets, on the Commonwealth's flats at South Boston. Granted June 22, 1903.

JOSEPH J. CALLAHAN, to build a temporary pile wharf in Dorchester Bay, at Squantum. Granted June 30, 1903.

CAMBRIDGE BRIDGE COMMISSION, to dredge a channel in Charles River. Granted July 7, 1903.

COHASSET YACHT CLUB, to dredge a channel and basin in Cohasset harbor. Granted July 17, 1903.

CHARLES C. WILLIAMS, to dredge a basin in Cohasset harbor. Granted July 30, 1903.

TIMOTHY L. WHITE, to dredge a channel and basin in Manchester harbor. Granted Sept. 3, 1903.

ALBERT WATTS, to remove material from his flats in Boston harbor near Sunnyside and Pico avenues, in Winthrop. Granted Sept. 8, 1903.

NANTASKET BEACH STEAMBOAT COMPANY, to remove accumulations of sand in the berths and around Pemberton Pier, in Hull. Granted Sept. 15, 1903.

LAKE GROVE CEMETERY ASSOCIATION, to use and occupy Grape Island in Lake Winthrop, in Holliston. Granted Sept. 22, 1903.

WORK OF THE UNITED STATES IN RIVERS AND HARBORS
OF THE COMMONWEALTH.

The Board is indebted to Lieut.-Col. W. S. Stanton, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and Capt. Cassius E. Gillette, Corps of Engineers, U. S. A., who is in charge of similar work in southern Massachusetts, for the following statements, which show the work accomplished in the rivers and harbors of this Commonwealth during the fiscal year ending June 30, 1903:—

STATEMENT OF LIEUT.-COL. W. S. STANTON, CORPS OF ENGINEERS,
U. S. A.

BOSTON, MASS., Dec. 8, 1903.

Harbor and Land Commissioners, Commonwealth of Massachusetts, State House, Boston, Mass.

SIRS:—In accordance with your request of Oct. 15, 1903, I have the honor to furnish the following summary of work done by the United States during the fiscal year that closed June 30, 1903, in the rivers and harbors in Massachusetts under my charge.

Merrimac River.

Under a contract for dredging the channel 7 feet deep at mean low water and 150 feet wide through all shoals below Haverhill, 17,576 cubic yards were dredged from two shoals at and within $1\frac{1}{2}$ miles of Rocks bridge. At the close of the fiscal year dredging was in progress, and the channel was completed except at that locality.

Breakwater for Harbor of Refuge, Sandy Bay, Cape Ann.

Under a contract for continuing the construction of this breakwater, 137,682 tons of stone were deposited during the year, completing the substructure for a length of 475 feet and a part of the core of the superstructure. At the close of the fiscal year work was in progress; 3,500 linear feet of the substructure of the southern arm, and about 875 feet of the substructure of the western arm, had been practically completed.

Rockport Harbor.

In rebuilding the Bearskin Neck breakwater at the harbor entrance, 1,332 tons of rubblestone were deposited, completing 160 linear feet. Work was in progress at the close of the fiscal year.

Gloucester Harbor.

Under the contract for completing the breakwater on or before Sept. 30, 1906, 2,364 tons of dimension stone and 1,742 tons of rubblestone were placed in 216 feet of superstructure. At the close of the year the substructure extended 1,750 feet and the completed superstructure 277 feet from the shore, and work was in progress on the superstructure.

Lynn Harbor.

Under a contract for dredging 95,000 cubic yards, 44,783 cubic yards were dredged, obtaining a channel 15 feet deep at mean low water, 100 feet wide, and extending from the deep basin opposite Little Nahant 2,600 feet toward the sea, to which, it is expected, the channel will be extended under the contract. Work was in progress at the close of the year.

Boston Harbor.

In the upper main ship channel 12,260 cubic yards were dredged, completing it to the full dimensions authorized by law, 27 feet deep at mean low water and 1,000 feet wide, from Boston,

16,000 feet to President Roads, except the removal of 10 ledges containing 3,404 cubic yards of rock.

In the lower main ship channel, from President Roads through the Narrows to the sea, drilling and blasting under a contract for the excavation of 19,008 cubic yards for the removal of 21 ledges were commenced Oct. 25, 1902, and were in progress at the close of the fiscal year.

In Broad Sound, under a contract for dredging a channel 30 feet deep at mean low water and 1,200 feet wide, 240,681.5 cubic yards of mud, sand, gravel and clay were dredged.

On April 10, 1903, when the channel had been dredged to a minimum width of 930 feet and minimum depth of 28 feet at mean low water, it was buoyed, and range lights were established on Lovell's Island and Spectacle Island for its safe navigation. Its completion to the full depth of 30 feet and full width of 1,200 feet is expected by Dec. 31, 1903.

In February, 1903, under the project authorized by act of Congress, approved June 13, 1902, to obtain a channel 35 feet deep at mean low water, 1,200 feet in width in the upper main ship channel from Boston to President Roads, and 1,500 feet in width from President Roads to the sea at Broad Sound, four contracts were made for dredging in the aggregate 9,780,000 cubic yards, of which 7,500,000 will be dredged from the upper main ship channel and 2,280,000 from the channel to Broad Sound. The completion of these contracts, which is required by Dec. 31, 1907, will obtain a channel 35 feet deep at mean low water from Boston to Broad Sound, about 500 feet wide in the upper main ship channel and about 675 feet wide in the Broad Sound channel. Dredging under one contract commenced April 6, and to June 30 60,881 cubic yards of clay had been dredged in uncovering a considerable area of rock in the upper main ship channel in order that its excavation might be commenced with the least delay practicable.

The extensive rebuilding and repair of the three sea walls on Deer Island, large portions of which were demolished in the storm of November, 1898, were continued. At the close of the fiscal year the rebuilding of the two walls, at the north and middle heads, had been practically completed, and the rebuilding of the wall at the south head had been commenced. The extensive repointing of the sea walls on Great Brewster, Gallop's, Long and Lovell's islands, which was commenced in 1901, was in progress throughout the fiscal year, and was well advanced towards completion at its close.

In Chelsea Creek, 4,732 cubic yards of mud were dredged, obtaining a channel not less than 50 feet wide and 14 feet deep at mean high water to Proctor's wharf.

Mystic and Malden Rivers.

In the Mystic River, below the mouth of Island End River, 81,241.5 cubic yards of mud, sand and clay were dredged from the channel at the confluence of Island End River, obtaining a channel with a minimum width of 150 and maximum width of 300 feet, 25 feet deep at mean low water, to a point 400 feet above the mouth of Island End River. From the draw-way of Chelsea bridge a mass of refuse timber, which had diminished the depth to 21 feet, was removed, restoring it to 25 feet at mean low water.

Cohasset Harbor.

In the harbor 10,330 cubic yards of mud, sand, gravel and clay were dredged, obtaining a channel 2,000 feet in length, 4 feet deep at mean low water, 60 feet in width except at the curves, where it is increased to 75 feet. Work was in progress at the close of the fiscal year for continuing the dredging and for removal of a ledge from the channel.

Plymouth Harbor.

From the turning basin at the wharves 12,200 cubic yards of mud and sludge were dredged, restoring an area of about 3 acres to a depth of 9 feet at mean low water, to which depth it had been before redredged, in 1899.

Provincetown Harbor.

Three groynes of timber and brush, 150 feet apart, 180 feet in length, were built upon the beach at Abel Hill dike, which prevented encroachment of the sea upon the beach and dunes during the winter.

Very respectfully, W. S. STANTON,
Lieutenant-Colonel, Corps of Engineers.

Statement of Captain Cassius E. Gillette, Corps of Engineers, U. S. A., showing the work done by the United States on the rivers and harbors in Massachusetts under the Newport, R. I., engineer office during the fiscal year ending June 30, 1903 :—

Hyannis Harbor.

A contract for about \$18,000 worth of dredging was entered into Dec. 8, 1902, work to commence not later than April 1, 1903, extended to June 1, 1903, and later to June 15, 1903, and to be completed within six months of the time of commencement. Up to the close of the fiscal year the work had not been commenced.

Nantucket Harbor.

A contract was entered into for about \$6,120 worth of riprap stone to be placed in the east jetty under date of Jan. 19, 1903, work to commence not later than May 1, 1903, and to be completed July 8, 1903. The execution of the work contemplated under this contract was delayed, pending an examination of the effect of the breach in the Haulover Beach, on the jetty channel. A small amount of dredging was proposed near the outer end of the jetty channel to connect the 9-foot holes which had developed there. Proposals for this dredging were invited by public advertisement, but none were received.

Vineyard Haven.

No works of improvement have been in progress during the fiscal year. Further work at this harbor is dependent upon the results of the examination of the Board of Engineers, convened in accordance with the river and harbor act of June 13, 1902, to consider the general subject of harbors in the waters of this locality.

Woods Hole Channel.

A contract was entered into Dec. 11, 1902, for dredging and removing boulders to the amount of about \$18,000, at the rate of \$3.47 per cubic yard for all material other than boulders exceeding 1 cubic yard in size, for which the price was \$10 per cubic yard. The work was commenced May 19, 1903, and up to the close of the fiscal year 4,341 cubic yards of clay, gravel and small boulders and 42,272 cubic yards of the large boulders were removed, nearly completing the contract. The main channel has been cleared of all obstructing shoals for its full width, excepting two small shoals on the northern edge of the channel near Devil's Foot Island and the main shoal at the eastern end, through which a channel 225 feet wide has been dredged to the full projected depth of 13 feet at mean low water.

New Bedford Harbor.

A contract was made Dec. 2, 1902, for dredging the remainder of the anchorage area in this harbor, and redredging any shoaling that may have occurred in the channel through the draw. Amount of contract, about \$34,000. Time of commencement, Jan. 16, 1903, to be completed nine months after commencement. Price of dredging 19½ cents per cubic yard. On March 13, 1903, the dredge was temporarily removed to other work. Up to this date 45,124 cubic yards of mud, clay and sand had been removed. A map of

a proposed harbor line for New Bedford harbor was submitted Dec. 29, 1902, and approved March 8, 1903, by the Secretary of War.

Taunton River.

A contract was entered into April 28, 1903, for dredging the shoals that had formed in the previously dredged channel near Dighton wharf and below Wickamount. Amount of contract, about \$5,000. Price of dredging, 88 cents per cubic yard. The dredging was commenced May 19 and completed July 3, 1903.

Fall River Harbor and Mount Hope Bay.

A continuing contract was entered into Dec. 2, 1902, for dredging the proposed channel 300 feet wide and 25 feet deep at mean low water in front of the city and across Mount Hope Bay to the deep water of Narragansett Bay. Amount of contract, about 1,081,000 cubic yards. Price, 13.1 cents per cubic yard. Up to the close of the fiscal year 293,235 cubic yards had been dredged, and the work was in progress.

Removal of Wrecks.

During the fiscal year the following wrecks were removed so as no longer to form obstructions to navigation: the steamer "Williamsport" from 2 miles north-east of Pollock Rip light ship; the schooner "Thomas Borden" from Hyannis harbor; the barge "Wadena" from the Shovelful Shoal, south of Monomoy Point; the schooner "St. Thomas" from 3 miles south-east of Cape Poge light-house in Muskeget channel; the schooner "James G. Blaine" from about 1 mile south-south-east from Monomoy Point light-house; the schooner "Emily G. Sawyer" from 1½ miles south-west from Harding's Beach light-house; the schooner "Sarah Potter" from near the Handkerchief shoal. The wrecks of the following vessels were reported as dangerous obstructions to navigation, and preparations were made for their removal: schooner "Marriot," sunk 10 miles west-south-west from Vineyard Sound light ship; schooner "Dora Methews," near Bass Rip, 3 miles east of Sankaty Head, Nantucket Island; schooner "Agnes E. Manson," sunk in same locality; and the barge "Fidelia," sunk 3 miles west of the Hen and Chickens lightship in the entrance to Buzzards Bay.

BRIDGE BETWEEN FALL RIVER AND SOMERSET.

Under chapter 462 of the Acts of 1903 the Board of Railroad Commissioners, the Board of Harbor and Land Commissioners and the county commissioners of the county of

Bristol were constituted a joint Board, and authorized and directed to locate and construct a new drawbridge between the city of Fall River and the town of Somerset, over Taunton Great River. The members of this commission have attended, up to the date of this report, meetings of the joint Board held July 13, September 17, October 12, November 16 and 20, and have listened to parties interested in the subject matter of the act. They also, in company with other members of the joint Board, have inspected the present Slades Ferry bridge across this river, used for highway, railroad and street railway purposes, and the several sites suggested for the location of the new bridge.

APPROPRIATION FOR SURVEY AND IMPROVEMENT OF HARBORS.

Under section 9 of chapter 96 of the Revised Laws, the Board is authorized to make surveys and improvements for the preservation of harbors, to repair damages along the coast line or river banks of the Commonwealth, and to take land or materials necessary for making such improvements or repairs. Section 10 authorizes the expenditure of not exceeding \$10,000 in carrying out the provisions of section 9.

Expenditures from this appropriation have been made during the year in the localities and to the amounts following, viz.:—

Bass River in Beverly, survey,	\$539 81
Bass River at South Yarmouth, survey,	116 10
Connecticut River, repairs,	1,112 51
Easterly shore of Dorchester, survey,	220 02
Lake Anthony, improvement,	204 01
Menamsha Inlet, survey,	43 01
Nantucket harbor, improvement,	1,043 50
Northerly shore of Quincy, survey,	60 00
Scituate, survey,	54 13
Shirley Gut, survey and improvement,	452 00
Stage Harbor, Chatham, survey,	65 88
Weymouth Fore River, survey,	150 31
West Bay at Osterville, improvement,	140 80
Winthrop Channel, survey,	78 00
Total,	<hr/> \$4,280 08

HARBOR COMPENSATION FUND.

There was paid into the treasury of the Commonwealth during the year, under chapter 146 of the Acts of 1897, and chapter 96 of the Revised Laws, for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of \$26,995.32, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1903, was \$416,896.40; the balance of income from this fund in the treasury on the same date was \$6,150.50; the total income for the year was \$14,510.68.

COMMONWEALTH'S FLATS IMPROVEMENT FUND.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1902, was \$1,516,362.95. To this has been added during the year \$67,898.94 from the income of the fund and \$30,167.55 from sales and rents of lands and other sources, making a total of \$1,614,429.44. Of this sum there has been expended during the year \$248,195.89, leaving a balance on Nov. 30, 1903, of \$1,366,233.55, subject to reduction for existing liabilities by reason of the anchorage basin contracts under chapter 476 of the Acts of 1901, for contribution toward building Northern Avenue and bridge under section 4 of chapter 381 of the Acts of 1903, and for filling the 26-acre lot on the Commonwealth's flats at South Boston.

A list* of the acts and resolves showing the trend of legislation relative to subject matters within the jurisdiction of this Board, from 1899 to 1903, inclusive, has been compiled as a ready reference, and is printed in the Appendix.

The foregoing report is respectfully submitted.

WOODWARD EMERY,
CHARLES C. DOTEN,
GEORGE E. SMITH,

Commissioners.

DEC. 1, 1903.

* See Appendix D.



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APPENDIX.

APPENDIX.

[A.]

[See page 4 of this report, *ante*.]

CONTRACTS.

The contracts entered into during the year are as follows: —

1903.	
March 26.	With George H. Cavanagh, for building a spruce bulkhead on the Commonwealth's flats, at South Boston, for the sum of \$7.90 for each lineal foot of bulkhead, and 60 cents for each lineal foot of horizontal platform and levelling the filling under the same, — amounting to \$5,763 10
June 15.	With John H. Gerrish, for dredging channel at the mouth of Bass River, in Dennis and Yarmouth, — amounting to 6,500 00
July 28.	With John H. Gerrish, for dredging channel at Menamsha Inlet, in Gay Head and Chilmark, — amounting to 8,250 00
Oct. 16.	With the Harries & Letteney Company, for dredging channel in Weymouth Fore River, in Quincy, — amounting to about 8,000 00
<hr/>	
Total, about \$28,513 10	

[B.]

[See page 15 of this report, *ante.*]

LICENSE TO BROWN-WALES COMPANY.

WHEREAS, The Brown-Wales Company, a corporation duly established under the laws of the Commonwealth, has applied to the Board of Harbor and Land Commissioners for authority to lay and operate a track on C and Egmont streets on the Commonwealth's flats at South Boston, —

Now, said Board, by virtue of chapter 377 of the Acts of 1902, and all other acts thereto enabling, hereby authorizes and licenses the Brown-Wales Company to lay and operate, at grade, a railroad track in C and Egmont streets as shown on the accompanying plan, subject to the authority and control of the Railroad Commissioners as provided by said statute ;

But this license is granted by the Board upon the following express conditions, that : —

First, all tracks shall be laid on wooden ties with 7-inch girder rails of a pattern approved by the chief engineers respectively of the New York, New Haven & Hartford Railroad Company and of this Board ; the space between the rails and 18 inches outside the same shall be paved with granite blocks on a gravel foundation ; and all work and material shall be of a substantial character, and to the satisfaction of the respective chief engineers aforesaid.

Second, the licensee shall at its own sole expense keep the tracks in said streets in good condition and repair, and properly guarded and protected for the passage of teams along said streets and over said tracks.

Third, no car shall be permitted to stand in C Street or Egmont Street for the purpose of loading and discharging, nor be or remain in said streets at any time except for the purpose of shunting between the premises of the licensee and the railroad yards, and then only for such reasonable time as may be necessary therefor.

Fourth, the licensee shall be liable for any injury, and shall assume and pay any and all damages caused by the laying and operation of the tracks hereby authorized.

Fifth, the licensee shall permit the use of the tracks hereby authorized in said streets, by any other person or corporation licensed therefor by this Board, upon payment to the licensee of a reasonable compensation to be agreed upon by the parties, or, in the event of the parties failing to agree, to be determined by the Board of Railroad Commissioners.

Sixth, the track hereby authorized to be laid shall be removed or shall be changed to other locations in said streets and relaid by the licensee and the premises left suitable for public travel, at its sole expense, upon the order of this Board, after notice and hearing, and determination that the further continuance thereof as laid is detrimental to the public interest; and if the licensee shall fail or neglect to carry out the order of the Board for a period of ten days after notice thereof, then this Board may perform the requirements of said order at the expense of the licensee, and recover the same in the name of the Commonwealth.

Seventh, said corporation shall file with the clerk of this Board, within thirty days of the date of this license, its acceptance of the same, and its agreement to comply with the requirements thereof; in case of failure to file said acceptance and agreement, or of failure subsequently to perform any of the foregoing requirements, or of failure to lay the tracks in C and Egmont streets as aforesaid within one year from the date of the approval hereof by the Governor and Council, then and thereupon this license shall be null and void.

IN WITNESS WHEREOF, said Harbor and Land Commissioners have hereunto set their hands this twenty-second day of June, in the year nineteen hundred and three.

WOODWARD EMERY,
CHAS. C. DOTEN,
GEO. E. SMITH,

Harbor and Land Commissioners.

COMMONWEALTH OF MASSACHUSETTS.

BOSTON, June 26, 1903.

Approved by the Governor and Council.

EDWARD F. HAMLIN,
Executive Secretary.

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At a duly notified meeting of the directors of the Brown-Wales Company, held at Boston the first day of July, 1903, at which a quorum was present, the following votes were passed : —

Voted, That the Brown-Wales Company hereby accepts the license from the Board of Harbor and Land Commissioners, dated June 22, 1903, to lay tracks to its premises on C and Egmont streets, South Boston, and agrees to comply with the requirements thereof.

Voted, That a copy of this vote shall be filed forthwith with the said Board.

A true copy. Attest:

WM. H. SHURTLEFF,
Sec'y.

[C.]

[See page 36 of this report, *ante*.]

REPORT OF THE SUPERINTENDENT, PROVINCE LANDS.

PROVINCETOWN, MASS., Dec. 1, 1903.

To the Board of Harbor and Land Commissioners.

GENTLEMEN: — As superintendent of the Province Lands, I respectfully submit the following report for the year ending with November, 1903.

The work has been carried along on practically the same lines as in former years, which consisted principally in transplanting grass, shrubs and trees, and the planting of pine seed. Active operations for the season began about the middle of March and continued until the last of May, when work was suspended for the summer months, being resumed about the middle of September, and continuing, as the weather permitted, through November. Only a small area of grass was planted during the spring months, the principal work being the planting of shrubs, trees and seed, which was done along the slopes that had been covered with grass in former years. Fairly good results were obtained, although the weather conditions were extremely unfavorable, a serious drought prevailing most of the time, which prevented many of the seed germinating and plants taking root.

The fall work, which was undertaken about the middle of September, consisted of the transplanting of beach grass and bayberry, thus covering an area of about 25 acres, including a small area of grass planting done in the spring. The bayberry was used along the upper portion of the slope, and the grass along the lower or flat portion, in the same manner as during the season of 1902.

Operations were carried on at that point upon the middle range of dunes where the work ended in the fall of 1902, that range being finished, and, in addition thereto, a section of about 10 acres covered on the south range eastward from Bennetts road.

The completed work shows gradual and decided improvement, especially along the northern range, where the reclamation was first commenced. The young pines and other trees, also the shrubs, for about a mile along this slope exhibit a vigorous and

healthy growth, which would seem to warrant the continuation of the improvement along the lines adopted, and the possibility of extending the variety of tree growth.

The road running across the lands and terminating at the outer beach or ocean side of the reservation is in good condition, and is much used by the public.

Since the commencement of operations upon these lands representatives of the Agricultural Department at Washington, D. C., particularly of the division of Agrostology, have frequently inspected the work, and shown great interest in its progress. I have been informed by a gentleman who has just returned from Europe, where he made an examination of similar works of reclamation which have been in progress for more than fifty years, that it is carried on there practically upon the same lines as it is on the Province Lands, and with about the same results.

Respectfully submitted,

JAMES A. SMALL,
Superintendent of the Province Lands.

[D.]

[See page 61 of this report, *ante*.]LIST OF ACTS AND RESOLVES FROM 1899 TO 1903,
INCLUSIVE.

- | Year. | Chapter. | |
|-------|----------|--|
| 1899. | 64. | An Act to cede certain land in Boston harbor, and jurisdiction over the same, to the United States, for the purpose of extending the present limits of the United States Navy Yard. |
| | 133. | An Act relative to the boundary line between the towns of Gay Head and Chilmark. |
| | 145. | An Act making an appropriation for the reclamation of the Province Lands for the benefit of Provincetown harbor. |
| | 155. | An Act relative to the construction of a channel from Vineyard Sound to Lake Anthony. |
| | 447. | An Act making an appropriation for the improvement of Green Harbor in the town of Marshfield. |
| | 448. | An Act to incorporate the Boston, Cape Cod & New York Canal Company. |
| | 463. | An Act to provide for the survey and improvement of harbors, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth. |
| | 469. | An Act relative to the improvement of Boston harbor. |
| | 96. | Resolve to provide for certain surveys by the Board of Harbor and Land Commissioners. |
| | 99. | Resolve to provide for an investigation by the Board of Railroad Commissioners and the Board of Harbor and Land Commissioners relative to the relocating and widening of the old bridge over the Acushnet River between the city of New Bedford and the town of Fairhaven. |
| 1900. | 194. | An Act to provide for the improvement of the inner channel of Lewis Bay. |

72 HARBOR AND LAND COMMISSIONERS. [Jan.

- | Year. | Chapter. | |
|-------|----------|--|
| 1900. | 309. | An Act to provide for the survey and improvement of harbors, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth. |
| | 434. | An Act to provide for building jetties, breakwaters, sea walls or other structures in the town of Scituate, by the Board of Harbor and Land Commissioners. |
| | 439. | An Act relative to the relocation and completion of the bridge over the Acushnet River between the city of New Bedford and the town of Fairhaven. |
| | 476. | An Act relative to the Boston, Cape Cod & New York Canal Company. |
| | 33. | Resolve to provide for a survey and estimate relative to the improvement of the harbor of Cuttyhunk. |
| | 42. | Resolve to provide for a survey and estimate relative to the improvement of the entrance to Waquoit Bay in the town of Falmouth. |
| | 97. | Resolve to provide for an examination and report by the Board of Harbor and Land Commissioners as to the anchorage of vessels in Boston harbor. |
| | 100. | Resolve to provide for the protection of the town of Hadley against the further encroachments of the Connecticut River. |
| 1901. | 243. | An Act to change the harbor line on the westerly side of Fish Island in New Bedford harbor. |
| | 245. | An Act to change the harbor line on the northerly side of Charles River in the city of Cambridge. |
| | 398. | An Act to provide for surveys and improvements for the preservation of harbors and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth. |
| | 399. | An Act to provide for the further improvement of Lake Anthony in the town of Cottage City. |
| | 411. | An Act to change a part of the harbor line on the northerly side of Charles River below Charlestown bridge. |
| | 419. | An Act to change the harbor line in Boston harbor at Jeffries Point, East Boston. |
| | 469. | An Act to transfer the powers and duties of the Commission on the Topographical Survey and Map of Massachusetts to the Board of Harbor and Land Commissioners. |
| | 476. | An Act to provide mooring facilities and additional anchorage ground in Boston harbor. |

Year. Chapter.

1901. 483. An Act to provide for the building of breakwaters, sea walls or other structures in the town of Hull by the Board of Harbor and Land Commissioners.
484. An Act to incorporate the South Bay Wharf and Terminal Company.
507. An Act to authorize the Commonwealth, the New England Railroad Company and the city of Boston to carry out certain obligations relating to Northern Avenue in said city.
38. Resolve to provide for a survey and estimate by the Board of Harbor and Land Commissioners as to the improvement of the harbor at Apponagansett in the town of Dartmouth.
39. Resolve to provide for a survey and estimate by the Board of Harbor and Land Commissioners as to the improvement of the entrance of Bass River in the towns of Dennis and Yarmouth.
66. Resolve to provide for a survey and estimate by the Board of Harbor and Land Commissioners as to the improvement of the entrance to Herring River in the town of Harwich.
94. Resolve to provide for the protection of the town of Hadley against the further encroachments of the Connecticut River.
102. Resolve to provide for additional surveys and estimates by the Board of Harbor and Land Commissioners as to the construction of a channel from East Bay in the town of Barnstable to Vineyard Sound.
104. Resolve to provide for surveys and estimates by the Board of Harbor and Land Commissioners as to the cost of constructing a ship canal from Taunton River to Boston harbor.
113. Resolve to direct the Board of Harbor and Land Commissioners to improve the channel at the entrance of Bass River, between the towns of Dennis and Yarmouth.
1902. 107. An Act making an appropriation for surveys, improvements and preservation of harbors, and for repairing damages occasioned by storms along the coast line and river banks.
174. An Act making an appropriation for improving the channel at the entrance of Bass River, between the towns of Dennis and Yarmouth.

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Year. Chapter.

1902. 313. An Act to change a part of the harbor line on the Merrimac River, along the water front of the city of Haverhill.
377. An Act relative to B Street and C Street and to the sale of land in South Boston.
425. An Act to direct the Board of Harbor and Land Commissioners to dredge a part of the southerly shore of South Boston.
491. An Act to provide for the further improvement of the channel between Vineyard Sound and Osterville Bay in the town of Barnstable.
509. An Act to provide for the improvement by the Board of Harbor and Land Commissioners of Appona-gansett harbor in the town of Dartmouth.
511. An Act making an appropriation for the reclamation of the Province Lands for the benefit of Provincetown harbor.
58. Resolve to authorize the Board of Harbor and Land Commissioners to dispose of certain equipment used in improving the channel of the Connecticut River.
71. Resolve to provide for a survey and estimate by the Board of Harbor and Land Commissioners as to the improvement of Cataumet harbor.
82. Resolve to provide for printing the report of the Board of Harbor and Land Commissioners as to a canal from Taunton River to Weymouth Fore River.
124. Resolve to authorize the Board of Harbor and Land Commissioners to make a survey and estimate to determine the cost of acquiring a part of Mount Tom and Mount Nonatuck as a State reservation.
130. Resolve to provide for an investigation and estimate by the Board of Harbor and Land Commissioners of the cost of improving the channel from Scorton harbor to Barnstable Bay in the town of Sandwich.
1903. 149. An Act to establish the boundary line between the towns of Braintree and Holbrook.
150. An Act to provide that persons employed by the United States Geological Survey or by the Board of Harbor and Land Commissioners of the Commonwealth may enter upon public or private land in the Commonwealth.
194. An Act to establish a part of the boundary line between the towns of Hanson and Pembroke.

Year. Chapter.

1903. 258. An Act to cede to the United States government jurisdiction over a tract of land called the Graves, near the entrance to the harbor of Boston.
341. An Act to provide for dredging the channel of Bass River in the city of Beverly, and for widening the draw of Bass River bridge in that city.
363. An Act to change the harbor lines on the westerly and easterly sides of Fish Island in New Bedford harbor.
366. An Act to direct the Board of Harbor and Land Commissioners to dredge the northerly shore of Quincy between Wollaston and Squantum.
373. An Act to establish the boundary line between the towns of Andover and Tewksbury.
376. An Act to authorize the Board of Harbor and Land Commissioners to construct an entrance to East Bay at Osterville in the town of Barnstable.
378. An Act to establish a part of the boundary line between the towns of Belmont and Watertown.
379. An Act to establish a part of the boundary line between the towns of Concord and Carlisle.
380. An Act to establish the boundary line between the towns of Foxborough and Walpole, and a part of the line between the towns of Foxborough and Norfolk.
381. An Act relative to the laying out and construction of Northern Avenue and Sleeper Street in the city of Boston.
389. An Act to establish the boundary line between the town of Medfield and the towns of Dover, Walpole and Norfolk.
394. An Act to provide for the further improvement of the outlet from Menamsha Pond into Vineyard Sound.
439. An Act to direct the Board of Harbor and Land Commissioners to dredge the easterly shore of the Dorchester district of the city of Boston.
440. An Act to direct the Board of Harbor and Land Commissioners to improve the channel of Weymouth Fore River.
462. An Act to provide for the construction of a bridge over Taunton Great River between the city of Fall River and the town of Somerset.

Year. Chapter.

1903. 25. Resolve to provide for a survey and estimate by the Board of Harbor and Land Commissioners for a harbor of refuge at Quicks Hole in the town of Gosnold.
46. Resolve to direct the Board of Harbor and Land Commissioners to complete the improvement of the channel of Bass River between the towns of Dennis and Yarmouth.
47. Resolve to authorize the Board of Harbor and Land Commissioners to build certain structures in the vicinity of Stage harbor in the town of Chatham.
71. Resolve to provide for a survey and estimate by the Board of Harbor and Land Commissioners as to the improvement of Annisquam River in the city of Gloucester.
82. Resolve to provide for the protection of the town of Hatfield against the further encroachment of the Connecticut River.

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239012
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Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1904, covering a period of twelve months, from Nov. 30, 1903, being the twenty-sixth annual report of the Board since its establishment by chapter 263 of the Acts of 1879, which act conferred upon it the powers and duties of the several boards, established by chapter 149 of the Acts of 1866 and chapter 213 of the Acts of 1877.

From Dec. 1, 1903, to Nov. 30, 1904, the Board has held 210 meetings, has given 246 formal and informal hearings, and has received 152 petitions for license to build and maintain structures and for privileges in tide waters, great ponds and Connecticut River, to dredge material, to remove material from beaches, and for other purposes.

Ninety-nine licenses for structures and privileges in tide waters, great ponds and Connecticut River have been granted during the year; also 37 permits for dredging, for the removal of material from beaches, and for other purposes.

Sixty-six inspections have been made at various times by the Board, and under its direction, of work completed and in progress; also of sites of authorized work, under appropriations made by the Legislature, relating to: dredging operations in Boston harbor; improvements on the Commonwealth's flats at South Boston; the reclamation of the

Province Lands in Provincetown ; protective works on the Connecticut River at Hatfield and Hadley ; Bass River in Beverly ; Salem harbor ; wall and jetties at Stony Beach in Hull ; channel and jetties at Green harbor ; Stage harbor in Chatham ; Red River in Chatham ; jetties and channel at Menamsha Inlet ; jetties and channel at Lake Anthony ; Vineyard Haven harbor ; jetties and channel in Bass River at South Yarmouth ; East and West bays at Osterville ; Cotuit harbor ; Witchmere harbor in Harwich ; also upon petitions and plans presented to the Board of the sites of proposed work in tide waters, the location of wrecks and obstructions to navigation ; various structures built under licenses from the Board ; sites of alleged dumping of material into tide waters ; sites suggested for location of a new drawbridge across Taunton Great River, between Fall River and Somerset ; town boundary survey work.

Through transactions of the Board there has been paid into the treasury of the Commonwealth during the past year, from rents, licenses, sales of land and other sources, and credited to the Commonwealth's flats improvement fund and the harbor compensation fund for Boston harbor, the aggregate sum of \$34,983.71.

During the year the Board made 11 new contracts,* involving the estimated expenditure by the Commonwealth of \$93,272.39.

BOSTON TERMINAL COMPANY.

Certain lands of the Commonwealth in Fort Point channel, covered by tide water and abutting the harbor line established by chapter 170 of the Acts of 1880, were taken by the Boston Terminal Company on Jan. 5, 1897, under chapter 516 of the Acts of 1896, which authorized the building of the South Terminal station. On Sept. 2, 1897, the Board granted a license to the company to fill solid in tide water westerly of and adjoining the westerly side line of Dorchester Avenue extension, and between the southerly side line of Summer Street extension and the easterly side

* See Appendix A.

line of Federal Street, "without waiving any of the rights of said Commonwealth to claim, demand and recover any and all damages suffered by the taking of land under the provisions of chapter 516 of the Acts of 1896."

Subsequently, the Board placed the claim of the Commonwealth for payment for the lands so taken in the hands of the Attorney-General, who brought suit to recover the value of 63,410 square feet of land under tide water.

The Terminal company resisted payment on the grounds that the taking only changed the use of the land from travel by water to travel by land, inasmuch as it went into streets; and that in acting under chapter 516 of the Acts of 1896 it was by command of the Legislature and not of its own volition, and for these reasons it should not be charged with payment for the land. The Supreme Judicial Court failed to uphold the contention of the company and its liability became fixed. The parties have reached an agreement as to value without going to a jury, and the Terminal company is to pay the Commonwealth the round sum of \$94,000 in full satisfaction and discharge.

BOSTON HARBOR.

The natural advantages of Boston harbor for the purposes of a great port are familiar to the citizens of the Commonwealth. Up to the middle of the last century they sufficed for the growing commerce without artificial assistance. Now, however, the advent of enormous steamships as carriers of merchandise and passengers requires the deepening of channels, broadening of basins, lengthening of docks and the enlargement of piers and wharves, together with generally increased accommodation and improved facilities for handling cargoes.

If economical accommodation is lacking at one port it is sought at another, and although superior economies are not wanting at the port, they must coexist with adequate facilities for rail transportation to hold success in competition.

In the long run the well-equipped port, which puts the smallest toll on goods from the interior passing through for

transportation abroad, stands the best chance for large traffic. Striking instances of a greatly increased volume of business following a perfected equipment for transporting and handling grain are observable at New Orleans and Montreal. In both places large and judicious expenditures by the municipalities and the railroads combined to create most favorable arrangements for transshipment at the least cost. In connection therewith the mouth of the Mississippi was deepened and the channels of the St. Lawrence were enlarged so as to increase their navigable capacity and render navigation safer. The result was an immense growth in export of cereals at those ports, far beyond any previous experience, which continued so long as demanded by the markets abroad, and also an ability to maintain successful competition when the demand slackened.

It may be interesting to note how fairly well during the recent five-year period the exports of grain from Boston have held, compared with other leading ports on this continent, as exhibited in the following table, showing in round numbers the proportionate decrease in the total bushels of grain shipped from the Atlantic and Gulf ports, 1899-1903 : —

Montreal declined from 28,000,000 to 25,000,000 bushels.
Portland declined from 11,000,000 to 3,000,000 bushels.
Boston declined from 37,000,000 to 14,000,000 bushels.
New York declined from 97,000,000 to 42,000,000 bushels.
Philadelphia declined from 41,000,000 to 11,000,000 bushels.
Baltimore declined from 61,000,000 to 23,000,000 bushels.
Newport News declined from 22,000,000 to 3,000,000 bushels.
New Orleans declined from 34,000,000 to 25,000,000 bushels.
Galveston increased from 22,000,000 to 24,000,000 bushels, though in 1902 only 12,056,594 bushels were exported.
The value of the total imports and exports at Boston, 1875-79, was \$439,640,323.
The value of the total imports and exports at Boston, 1899-1903, was \$914,075,225.

This is a good showing, notwithstanding the falling off in exports of grain from 37,000,000 bushels in 1899 to 14,000,000 in 1903. The value of the exports was sustained by manufactured products, in which there was a large increase.

At the same time, imports increased from \$63,500,000 in value in 1899 to \$82,500,000 in 1903. The growth in exports of manufactured products, which must be the future reliance of the port for any marked prosperity, and the growth of imports are distinctly encouraging indications of development.

The high quality of the product of specialized industries of New England has recently been the subject of favorable comment by several disinterested foreign observers, and it unquestionably is upon that class of manufacturing interests that the future welfare of the eastern States must depend. The industrial enterprises must be relied on to provide material for commerce with the outside world.

The conditions of transportation in this country of both domestic and export merchandise are as yet unsettled. Discrimination in favor of some ports and against others still prevails, but the advantages of a port which offers ample accommodation with the best facilities for handling freight at a minimum charge cannot fail of ultimate recognition, and these are the points toward which intelligent effort is continually directed.

When the time shall come that a uniform contract price covers the transportation of grain from a fixed zone in the interior of the United States to a fixed zone abroad, then shall we realize to its full extent the value of improved accommodations and increased facilities which the railroads, the Commonwealth and the Federal government by their several expenditures in the direction of a common benefit have been enabled to secure.

The progress of harbor improvement at Boston during the past year, although slower than could be desired, has on the whole been fairly satisfactory.

Through the courtesy of Col. W. S. Stanton, U. S. A., engineer in charge of the district, the Board is able to report progress in the United States projects for improvement up to Dec. 1, 1904, as follows, viz. :—

Project approved July 13, 1892: to deepen and widen the main ship channel to a depth of 27 feet and a width of 1,000 feet. Under this project the upper and lower main ship channels have been

dredged 1,000 feet wide and 27 feet deep. The width available to navigation is, however, contracted by ledges uncovered by dredging. Contracts for the removal of all remaining ledges are now in force and operations under them are in progress. It is expected that they will be completed during the ensuing season of 1905.

Project approved March 3, 1899: to provide for a channel 1,200 feet wide and 30 feet deep from the main ship channel in President Roads through Broad Sound channel. This channel has been dredged 30 feet deep at mean low water to the full width of 1,200 feet throughout, but seaward of the angle in the channel the available width is reduced to 1,145 feet by ledges and will be increased to 1,200 feet by dredging next season.

Project approved June 13, 1902: to provide channels 35 feet deep at mean low water, 1,200 feet wide from the navy yard at Charlestown and the Chelsea bridge and Charles River bridge to President Roads, and 1,500 feet wide from President Roads through Broad Sound to the ocean.

Four contracts are in force each for dredging 2,445,000 cubic yards, aggregating 9,780,000 cubic yards, of which 7,500,000 are to be dredged from the channel between the bridges and President Roads and 2,280,000 cubic yards from Broad Sound, at the completion of which, Dec. 31, 1907, it is expected that a channel 35 feet deep, 540 feet wide, from Chelsea and Charles River bridges to President Roads, and 675 feet wide from President Roads through Broad Sound to the ocean, will have been obtained. Under these contracts 2,318,568.5 cubic yards have been dredged, 2,107,246.5 from the upper main ship channel and 211,322 cubic yards from the Broad Sound section. This work has been carried on disconnectedly in the four divisions, so that at the present time there is no continuous width of channel of 35 feet depth available for navigation.

The new lighthouse of granite at the outer Graves, to mark the entrance to the harbor by way of Broad Sound, is built up to its full height of stonework 88 feet, and is awaiting the arrival of the lenses for installation of another light of the first class.

The Lighthouse board has recommended the erection of a lighthouse on State Ledge at the "Lower Middle," to cost \$52,000. It is much needed as an aid to navigation at a point where there is a turn or angle in the channel, with nothing marking the change of direction sufficiently con-

spicuous to be sighted in foggy weather. The place will be remembered as the ledge on which the "Venetian," an iron steamship of 4,195 tons, was wrecked in 1895.

ANCHORAGE.

By chapter 476 of the Acts of 1901, the Board was authorized to dredge, and to build and maintain structures in Boston harbor northerly of the main ship channel, for the purpose of providing mooring facilities and additional anchorage ground. The expenditure of \$1,000,000 was authorized by this act, not more than one-fourth part to be expended in any one year.

In 1902 contracts were entered into for dredging an area lying along the northerly side of the main ship channel in the upper harbor, covering about 1 mile in length and 1,000 feet in width, to a depth of 30 feet at mean low water, the whole area, with a view to carrying on the work economically and expeditiously, having been divided into four sections of approximate areas and amounts of excavation (scow measurement), as follows:—

	Approximate Area (Square Feet).	Approximate Excavation (Cubic Yards)
Section 1,	1,505,000	743,500 .
Section 2,	1,200,000	749,300
Section 3,	1,150,000	743,700
Section 4,	1,630,000	752,400

The above contracts provided for the completion of all the work in each section by July 1, 1904, but the time for the completion of section 2 was extended to April 1, 1905.

It was concluded to defer the construction of the pile piers for mooring vessels and the solid filling on Bird Island shoal, which is apart of the approved project, until the dredging of the area nearest the ship channel has been nearly completed.

Up to July 1, 1904, only about one-half of the work had been completed, although considerably more than that proportion of the whole area had been dredged. The depth of material to be excavated is much greater on the area remaining to be done than on the portion completed.

The contractors for the various sections also have contracts with the Federal government for excavating portions of the main ship channel of Boston harbor, and inasmuch as the government projects and their completion seemed to the Board of paramount importance, objection has not been made to the temporary transfer, on several occasions, of dredging machines from the anchorage basin to the government work; consequently all the work under contracts now in force cannot be completed before the fall of 1905, the available space for anchorage of deep-draft vessels, however, has already been materially increased.

The amount of material excavated (scow measurement) from each section during the year, and the total amount excavated up to Dec. 1, 1904, are as follows:—

	Amount excavated from Dec. 1 1903, to Dec. 1, 1904 (Cubic Yards).	Total Amount excavated to Dec. 1, 1904 (Cubic Yards).
Section 1,	70,884	474,332
Section 2,	226,485	414,632
Section 3,	34,425	440,783
Section 4,	69,107	474,100
Totals,	400,901	1,803,847

The total amount expended on this project up to Dec. 1, 1904, is \$247,760.26.

DREDGING IN BOSTON UPPER HARBOR.

In December, 1903, the Board was informed that a shoal existed in Boston harbor at the westerly end of Bird Island flats, off piers Nos. 6 and 7 of the Grand Junction wharves in East Boston, which interfered with steamers of the Leyland line in approaching and leaving dock.

A survey was made in December, 1903, and it was found that to provide a depth of 27 feet at mean low water and sufficient area would necessitate the dredging of 11,500 cubic yards, *situ* measurement, from an area of about 28,500 square feet. This dredging would remove a shoal injurious to navigation generally, beside giving unimpeded passage to the steamships of that line.

On Jan. 13, 1904, a contract was entered into with the Eastern Dredging Company to dredge the above area to 27 feet at mean low water, the contract price being 23½ cents per cubic yard, measured in scows. The work was completed March 31, 1904, 15,340 cubic yards having been dredged, at a cost of \$3,604.90, paid from the income of the compensation fund for Boston harbor.

In addition to the above work, the contractors for section 1 of the anchorage basin in Boston harbor have excavated the whole width of the westerly end of said section where it projected in front of the dock between piers Nos. 6 and 7, thus removing all shoal spots between the dock and the main ship channel.

DORCHESTER BAY.

Dredging operations necessary to provide anchorage basins in Dorchester Bay, off the southerly shore of South Boston, authorized by chapter 425 of the Acts of 1902, have been carried on during the year under a contract with the New England Dredging Company and Eastern Dredging Company, jointly, made Oct. 29, 1902, the price being 21 cents per cubic yard, measured in scows. The act provides for an expenditure not exceeding \$25,000 in each of the years 1902-03-04-05.

The work is divided into two sections, respectively known as the 9-foot area and the 6-foot area. The 9-foot area is the larger and is located near the public landing and the landings at the South Boston and Boston Yacht Club houses. The smaller area is located near the L Street bath house and the landing of the Mosquito Fleet Yacht Club. The dredging on the 9-foot area has been completed with the exception of about 21 acres at the south-westerly corner.

Only a small amount of work was done during the year

on the 6-foot area, but it is proposed to have substantially all the work on both areas completed at the beginning of the next yachting season.

During the year 108,626 cubic yards have been excavated, making a total of 339,248 cubic yards up to Dec. 1, 1904.

The amount expended to the same date is \$60,500.75.

DREDGING EASTERLY SHORE OF DORCHESTER.

On Jan. 28, 1904, the Board, acting under authority of chapter 439 of the Acts of 1903, which provided for dredging a channel off the easterly shore of the Dorchester district of the city of Boston and appropriated \$25,000 therefor, entered into a contract with the Bay State Dredging Company for dredging an anchorage basin between Savin Hill and Commercial Point, Dorchester, in the flats adjoining the main channel of Neponset River, and for enlarging the channel leading from that main channel to the wharves on the northerly side of Commercial Point, the channel to be 12 feet deep at mean low water, 75 feet wide on the bottom and about 700 feet long, and the anchorage basin 9 feet deep at mean low water, 350 feet wide and about 500 feet long, or about $4\frac{1}{2}$ acres. The contract price was $23\frac{9}{10}$ cents per cubic yard, measured in scows.

This work was completed in August, 1904, at a cost of \$24,334.02. The total amount expended for this improvement up to Dec. 1, 1904, is \$25,363.66, the sum in excess of the appropriation, \$363.66, having been paid from the appropriations of 1903 and 1904 for the survey and improvement of harbors.

In connection with the above work the Savin Hill Yacht Club has dredged a channel, at its own expense, leading from the anchorage basin to the landing in front of its club house, and the Boston Yacht Club has made excavations to extend the deep water up to its landing. These improvements permit the owners of larger boats to anchor their craft out of the channel, where they are practically safe from collision with vessels and barges navigating the river, whereas they formerly anchored in the channel.

DREDGING NORTHERLY SHORE OF QUINCY.

On April 4, 1904, the Board, acting under authority of chapter 366 of the Acts of 1903, which provided for dredging a channel off the northerly shore of Quincy, between Wollaston and Squantum, and appropriated \$7,500 therefor, entered into a contract with the Harries & Letteney Company for dredging a channel in Quincy Bay, nearly opposite Sachem Brook, 2,300 feet long, 40 feet wide on the bottom and 3 feet deep at mean low water, and a branch channel 370 feet long, of the same width and depth, in accordance with plans made the previous season, the contract price being \$6,800. Subsequently the branch channel was extended 50 feet. The work was completed July 1, 1904, at a cost of \$7,000, and these channels afford access at low tide to the two yacht club landings located at this place. The total cost of this improvement up to Dec. 1, 1904, is \$7,329.75.

WEYMOUTH FORE RIVER.

By chapter 440 of the Acts of 1903 an appropriation of \$25,000 was made for dredging the channel in Weymouth Fore River to 24 feet at mean low water. For the reasons stated in the report of last year the project was curtailed to limited dimensions and carried out on those lines.

On Oct. 16, 1903, a contract was entered into with the Harries & Letteney Company to dredge the channel of this river, extending from Quincy Point bridge down stream about 1,850 feet, the general width to be 200 feet on the bottom, and the depth 15 feet at mean low water, the amount of excavation being estimated at about 22,000 cubic yards, measured *in situ*. The contract price was 29½ cents per cubic yard, scow measurement, and the work was completed Jan. 1, 1904.

The channel thus excavated enables vessels drawing 23 feet to navigate this portion of the river.

The total amount expended up to Dec. 1, 1904, is \$10,235.87.

COMMONWEALTH FLATS AT SOUTH BOSTON.

The Commonwealth owns a large tract of filled land at South Boston, commonly known as the South Boston flats, shown on the plan accompanying the annual report of the Board for 1903, and located both northerly and southerly of Summer Street, easterly of the railroad terminal, and having a long frontage on Boston upper harbor and the reserved channel.

The area northerly of Summer Street is 4,317,234 square feet, or 99.1 acres, exclusive of piers, but including the filled portion of the Commonwealth pier, 4,662,234 square feet, or 107.2 acres; of this area 792,287 square feet, or 18.2 acres, is under lease. The area southerly of Summer Street, exclusive of streets, is 1,917,347 square feet, or 44.0 acres, of which 88,221 square feet, or 2.0 acres, is under lease, and 304,560 square feet, together with 47,000 square feet in two cross streets, or 8.1 acres in all, is used temporarily as a public play ground, under authority of chapter 421 of the Acts of 1891.

The filling of the area described in previous reports as the 26-acre lot, lying easterly of land of the Commonwealth leased to the Metropolitan Coal Company, was completed in July, 1904, under contracts entered into on June 26, 1902, and Oct. 27, 1902, with the New England Dredging Company and Eastern Dredging Company, jointly.

On Feb. 26, 1904, a contract was entered into with Thomas E. Ruggles to build an extension of 100 feet to the pile wharf built by the Commonwealth in 1902, and leased in that year, together with about 249,287 square feet of land to the Boston Molasses Company. The contract price was \$4,300 and the work was completed in July, 1904. This extension was desired by the lessee to enable it to discharge molasses from tank steamers; and for the greater wharf facilities an additional rent of \$453.40 is paid.

In order to provide a place of deposit for material taken from cellars and other excavations in various parts of the city, the Board has granted from time to time permits for depositing the same on the portion of the Commonwealth lands north of Summer Street, with a result of raising the

grade to the plane of 15 feet above low water, while a well-compacted surface is also obtained without cost to the State.

On July 5, 1904, the Commission on Height of Buildings in the City of Boston, appointed under the provisions of chapter 333 of the Acts of 1904, made an order establishing the boundaries of the district designated as A in said act which includes the Commonwealth's land at South Boston.

By section 3 of this act no building shall be erected to a height of more than 125 feet above the grade of the street in any district designated A, the restriction not to apply, however, to grain or coal elevators or sugar refineries in this district, nor to steeples, domes, towers or cupolas erected for strictly ornamental purposes, of fireproof material, on buildings of the above height or less in any district.

COMMONWEALTH PIER.

The Commonwealth pier at South Boston, 1,200 feet long and 400 feet wide, with a dock on the westerly side 175 feet wide at the outer end, 200 feet at the inner end and 30 feet deep at mean low water, and a berth at the outer end of the pier with the same depth, was built by the Commonwealth and completed, in respect to the pier proper in 1901, and dredging in 1902. The total cost of this pier up to Dec. 1, 1904, is \$381,877.09, paid from an appropriation of \$400,000 made by chapter 513 of the Acts of 1897. The structure, dock and berths are in substantially the same condition as stated in the report of the Board for 1903.

The use of this pier is largely dependent upon the construction of Northern Avenue and bridge elsewhere alluded to in this report.

The sum of \$249.50 has been collected and paid into the treasury of the Commonwealth during the year, to be credited to the Commonwealth's flats improvement fund, for the use by a steamer of the dock on the westerly side of the pier for the purpose of discharging its cargo into lighters alongside.

In May, 1904, the Board approved payment of \$11,250, being a balance due for work done on this pier under a contract with George A. Cahill dated March 6, 1899.

NORTHERN AVENUE AND BRIDGE.

By chapter 381 of the Acts of 1903, Northern Avenue was laid out across Fort Point channel, also a street connecting this avenue with Congress Street, across the lands of the New England Railroad Company, the Boston Wharf Company and of the Commonwealth known as the Commonwealth flats at South Boston.

The Board and the Boston Wharf Company complied with the provisions of sections 1 and 2 of the act, but the Railroad company delayed the execution and delivery of its release called for, in order that legislation might be obtained for the payment to it of any claim which the New England Railroad Company might have against the Commonwealth based on an agreement between the Commonwealth, the New York & New England Railroad Company and the Boston & Albany Railroad Company, made Aug. 1, 1882, and which provided, in brief, for the repayment to said New York & New England Railroad Company of the value of the land included within this avenue as laid out under chapter 381 of the Acts of 1903, when it should be taken for that purpose. The result of the application to the Legislature was the enactment of chapter 229 of the Acts of 1904, which authorized the Board, with the approval of the Governor and Council, to make an equitable adjustment of any such claim.

The release by the railroad companies was made March 15, 1904, and on June 3, 1904, the Board passed the following vote:—

Whereas, On the eighth day of December, 1869, an agreement was made between the Commonwealth of Massachusetts and the Boston & Albany Railroad Company, whereby the railroad company agreed to purchase the 50-acre lot, so called, on the South Boston flats from the Commonwealth for the sum of \$435,600, payable in twenty years from Oct. 1, 1872, the Commonwealth reserving the right to locate across said territory Northern Avenue 75 feet wide;

And *Whereas*, On June 24, 1873, another agreement was made between the same parties modifying said agreement of Dec. 8,

1869, by providing that the southerly portion of the area to be conveyed should be released to the Commonwealth and another area should be granted to the railroad company in substitution therefor along the westerly side of the premises, of such extent as would equal the value of the area released, the released area being valued at 20 cents per square foot, and the area in substitution therefor being valued at 50 cents per square foot, and further providing that in case Northern Avenue should be laid out under the indenture of four parts of a greater width than is stipulated in the agreement of Dec. 8, 1869, then the railroad company shall not be required to pay the Commonwealth for said additional area ;

And *Whereas*, On June 24, 1873, an indenture of four parts was entered into between the Commonwealth, the Boston & Albany Railroad Company, the Boston Wharf Company and the city of Boston, which provided that the city of Boston may lay out as a public street, without incurring any liability for land damages for so doing, Northern Avenue not more than 100 feet wide from Fort Point channel to the southerly boundary line of the 50-acre lot, as said avenue is shown on the plan annexed to the sixth annual report of the Harbor Commissioners, or as the same shall be located under this indenture, and the railroad company agreed to fill up said avenue to the grade of 16 feet above mean low water as fast as it filled its other land abutting on it; and the railroad company further agreed that the city should be subject to no grade or other damages for land taken from it by the city in performing its obligations under the indenture ;

And *Whereas*, On the third day of April, 1878, the Boston & Albany Railroad Company paid the Commonwealth the sum of \$330,000 in part payment for the 50-acre lot, at that time somewhat reduced in area, to be thereafter conveyed ;

And *Whereas*, By an agreement dated July 15, 1880, the Boston & Albany Railroad Company agreed to convey the 50-acre lot to the New York & New England Railroad Company in consideration of the payment of \$330,000 and other considerations ;

And *Whereas*, By an agreement dated Aug. 1, 1882, between the Commonwealth of Massachusetts, the Boston & Albany Railroad Company and the New York & New England Railroad Company, in settlement of claims, controversies and suits then pending, the Commonwealth agreed to convey the 50-acre lot, including the area to be occupied by Northern Avenue, to the New York & New England Railroad Company upon the payment of the sum of \$100,000, with interest, with the proviso that whenever Northern Avenue was laid out in such manner either by the Commonwealth

or the city of Boston, that the railroad company could not obtain compensation for the land so occupied, and then the Commonwealth should repay to the railroad company the value of the land so taken at the rate of 20 cents per square foot for the portion crossing the original area of the 50-acre lot and 50 cents per square foot for the area added under the agreement of 1873, with interest at 5 per cent per annum from May 1, 1882;

And *Whereas*, On May 27, 1889, the Commonwealth, having received the said \$100,000, with interest, in addition to the amount theretofore paid, did deed the 50-acre lot to the New York & New England Railroad Company;

And *Whereas*, By chapter 381 of the Acts of 1903 the Commonwealth laid out Northern Avenue 100 feet wide across the 50-acre lot and provided that no compensation for any land or flats of the railroad companies should be allowed or paid, and required the railroad companies to release to said city without compensation their land included within said avenue;

And *Whereas*, The railroad companies have released to the city of Boston without compensation their lands as by chapter 381 aforesaid required;

And *Whereas*, By chapter 229 of the Acts of 1904 it is provided that the release by the railroad company to the city of Boston of land within Northern Avenue shall be without prejudice to the claim of said company for payment for said land under the agreement of Aug. 1, 1882, and that the Board of Harbor and Land Commissioners, with the approval of the Governor and Council, may make an equitable adjustment of any such claim;

And *Whereas*, The Board of Harbor and Land Commissioners has duly considered the claim of the New England Railroad Company and its lessee, the New York, New Haven & Hartford Railroad Company, for compensation for said land, with a view to an equitable adjustment thereof, and has concluded that the use of the land has been an equivalent to the yearly interest;

Now, *Therefore*, In consideration of the foregoing, it is voted that the payment of \$22,545.60 for the 95,228 square feet of land at 20 cents per square foot, and the 7,000 square feet of land at 50 cents per square foot, released to the city of Boston for the building of Northern Avenue, would be an equitable adjustment of the said claim, and should be made upon a receipt of full satisfaction and discharge therefor from the railroad companies.

WOODWARD EMERY,

CHAS. C. DOTEN,

GEO. E. SMITH,

Harbor and Land Commissioners.

The foregoing action of the Board was approved by the Governor and Council June 9, 1904, and on June 16, 1904, a bill for \$22,545.60 was approved for payment of the claim.

Plans for Northern Avenue bridge across Fort Point channel were prepared by the city engineer of Boston, who filed with this Board, on June 24, 1904, on behalf of the city, a petition for their approval. A public hearing was given on July 6, 1904, and it was decided that the plans should be so amended that the two draw openings in the proposed bridge should each be not less than 75 feet wide. The plans as amended were approved on July 18, 1904, and license issued.

Subsequently the city submitted the same to the Secretary of War for approval. A public hearing was given on Sept. 26, 1904, by Col. W. S. Stanton, U. S. A., the engineer officer in charge of river and harbor work in this district, when various parties appeared in opposition, and this Board and others in favor.

The attitude of the Commonwealth was stated by the chairman of the Board to be as follows:—

In 1873, the Commonwealth, the city of Boston, the Boston & Albany Railroad and the Boston Wharf Company, in pursuance of a scheme for improving the navigation of Boston harbor and of developing a large area of useless flats, to result in a common benefit, made an agreement in writing for filling flats lying south-east of Fort Point channel for the purpose of improving the same, laying out streets and building bridges across the channel. Congress Street bridge, one of the bridges referred to in the agreement as Eastern Avenue bridge, was built soon thereafter. The building of Northern Avenue bridge has been delayed for various reasons until recently. Lately, however, the demands of trade have become such as to require its building, consequently, in 1903, the Legislature by chapter 381 of the Acts of that year enacted a statute, prepared by concurrent action of the counsel of all parties bound by said agreement, laying out Northern Avenue "from Atlantic avenue near Oliver street easterly to Fort Point channel, thence across said channel by a bridge and thence across the land of the New England Railroad Company and its lessee, the New York, New Haven and Hartford Railroad Company, and lands of the Commonwealth," as shown on the plan entitled "Plan of

the Location of Northern Avenue from Atlantic Avenue to and over the Lands and Flats of the Commonwealth at South Boston, and of Sleeper Street from Congress Street to Northern Avenue, March, 1903. Scale, 1 in. = 50 feet. Frank W. Hodgdon, Chief Engineer. Woodward Emery, Charles C. Doten, George E. Smith, Harbor and Land Commissioners."

By section 3 of said act the city engineer of Boston was required to build said avenue and "to construct said bridge on masonry piers and abutments with a superstructure of iron or steel or both, having a draw or passageway not less than sixty feet wide for vessels." The railroads and the Boston Wharf Company were required to and have released their lands to be occupied by the avenue, and the Commonwealth, in addition to building the portion of the avenue over its lands, is to pay the city the sum of \$260,000 toward the cost of building the bridge.

The city engineer has perfected the plans for the bridge and the same have been approved by the Harbor and Land Commission as required by the statute. These plans are now before the War Department for approval, and are submitted to you for recommendation. It is obvious that the interests of the Commonwealth, of the city of Boston, of the railroad companies and of the Boston Wharf Company are to be subserved by the building of this bridge. Public necessity and convenience demand it. The Commonwealth has at great cost filled a large area of territory which needs for its full development this bridge to the heart of the city of Boston. The Commonwealth has built a large pier, the largest in this country, having a length of 1,200 feet, a width of 400 feet and a surface area of over 11 acres, which will lie idle until this avenue and bridge are assured. The railroad companies require this immediate access from their freight yards to the heart of the city and large commercial interests demand its construction. The chief objection that can be urged would be its obstruction to the navigation of Fort Point channel. This necessary obstruction is mitigated as much as is possible by making a draw opening in the bridge at a suitable place, now planned to be 75 feet wide, and this is deemed adequate to meet all the requirements of navigation in that locality so far as it can at present be foreseen, and is satisfactory to the representatives of the largest steamers that navigate the channel. The objections against it are of the same character and can have no greater force than those raised against obstructing any navigable stream by a bridge with a suitable draw opening. The fact that there are eight bridges above this proposed one already on Fort Point channel is indubitable evidence of the necessity for navigable interests giving way to the neces-

sities of land travel and traffic. In this case I understand the objectors are largely wharf owners and not navigators. Private interests are asked to prevail over the public welfare. So far as the public is concerned it is another instance of one class of transportation facilities becoming slightly abridged for the purpose of largely increasing the accommodation of another equally if not more important class of transportation. The right and privileges of river navigation are again asked to yield exclusive enjoyment of a water section to enjoyment in common with land transportation.

Further hearing was given by the engineer officer on Oct. 6, 1904, when the chairman supplemented his previous statement by referring to decisions of the United States Supreme Court on the interpretation of the acts of Congress applicable to the question, as follows:—

I think it very important that the law on this question, involving the true scope of the hearing, which is fully established by decisions of the Supreme Court of the United States, should be brought to the attention of the department here and in Washington.

In the first place it is to be observed that the location of the proposed structure over navigable waters is wholly within the territory of the Commonwealth of Massachusetts.

And I state this because you well know that the law differs when the location is wholly within one State and when it lies between two States.

Second.—The grounds of the opposition are almost entirely based on injury to the business of individuals which would be caused by the erection of another bridge across Fort Point channel. While it is true that these objectors taken collectively form a part of the great public, and consequently are entitled to be heard on the question of whether the public convenience and necessity require their interests to give way to the greater good of the greater number, it is respectfully submitted that that question was ultimately and finally decided by the local powers clothed with full authority to decide that question.

Third.—While nothing said by me is to be interpreted as raising the question of the power of Congress over navigable waters, it is most respectfully submitted that the only question within the scope of proper inquiry by the War Department under existing acts of Congress is limited to the *location and form* of the proposed structure. The reading of the various acts of Congress for the protection and preservation of the navigable waters of the United States

admits of no other meaning under the interpretation given by the United States Supreme Court.

The case of the Lake Shore & Michigan Railroad Company v. Ohio, Vol. 165, U. S. Rep., p. 365 (1897), was a case where the railroad company, under its charter from the State, undertook to build a bridge without a draw over a navigable river, and that right was contested in the Supreme Court. The court decided that the provisions of the River and Harbor Act of Sept. 19, 1890, conferring upon the Secretary of War authority concerning bridges over navigable water ways, do not deprive the States of authority to bridge such streams but simply create an additional and cumulative remedy to prevent such structures, although lawfully authorized, from interfering with commerce.

It was contended that because they had the permission of the Secretary of War, the permission of the State was not necessary.

In the opinion of the court, delivered by Mr. Justice White, page 366, he says: "The contention is that the statute in question manifests the purpose of Congress to deprive the several States of all authority to control and regulate any and every structure over all navigable streams, although they be wholly situated within their territory. That full power resides in the States as to the erection of bridges and other works in navigable streams wholly within their jurisdiction, in the absence of the exercise by Congress of authority to the contrary, is conclusively determined."

Again: "The mere delegation of power to direct a change in lawful structures so as to cause them not to interfere with commerce cannot be construed as conferring on the officer named the right to determine when and where a bridge may be built."

Again: "The provision that it shall not be lawful to thereafter erect any bridge, 'in any navigable river or navigable waters of the United States, under any act of the legislative assembly of any State, until the location and plan of such bridge . . . have been submitted to and approved by the Secretary of War,' contemplated that the function of the Secretary should extend only to the *form* of future structures, since the act would not have provided for the future erection of bridges under State authority if its very purpose was to deny for the future all power in the States on the subject."

Fourth.—While it is true that the act of Congress aforesaid has been amended, it is submitted that no subsequent amendment has materially enlarged the scope of the authority of the Secretary of War in the foregoing particular. On the contrary, section 9 of the River and Harbor Act, approved March 3, 1899, contains the following proviso: "*Provided*, that such structures may be built under the authority of the Legislature of a State across rivers and

other water ways, the navigable portions of which lie wholly within the limits of a single State, provided the location and plans thereof are submitted to and approved by the Chief of Engineers and by the Secretary of War before construction is commenced." It cannot be contended that the words "location" and "form" will be interpreted as giving to the Secretary of War more than the power of regulation, certainly not the power of prohibition. A reference to the opinions of the Supreme Court of the United States in the cases following clearly indicated that the scope of the power intended by Congress to be vested in the Secretary of War with reference to obstructions in and over the navigable waters of the United States should be limited as above stated: *Willamette Bridge Co. v. Hatch*, 125 United States Rep. 1; *Cummings v. City of Chicago*, 188 United States Rep. 410; *Montgomery v. Portland*, 190 United States Rep. 89.

These are interesting cases inasmuch as they show the necessity, as the court decide, for the concurrent action on the part of the State and the United States. The authority that is delegated by the act of Congress to the Secretary of War to act is a limited authority. I do not undertake to say what the powers of Congress are; how far it could delegate its authority, because that question is not before us. The question is how far have the acts of Congress delegated to the Secretary of War the power to act in this particular case.

In *Cummings* against the city of Chicago, the Calumet River was, so far as its navigable rights went, ceded to the United States, and *Cummings* undertook to build a dock in that river under authority of the Secretary of War; but the Commissioners of Public Works had power, under the ordinances of the city of Chicago, to regulate building of that kind, and the intercession of the court was asked on the ground that *Cummings* had not only not obtained but had been refused permission of the commissioners to build into the river, although he had permission from the Secretary of War. The Supreme Court at Washington sustained the view of the plaintiffs that *Cummings* had no right to build in the Calumet River without the authority of the Board of Public Works of Chicago. The court says: "We may assume that Congress was not unaware of the decision of the above case in 1896 and of the interpretation placed upon existing legislative enactments. If it has intended by the act of 1899 to assert the power to take under national control, for every purpose, and to the fullest possible extent, the erection of structures in the navigable waters of the United States that were wholly within the limits of the respective States, and to supersede entirely the authority which the

States, in the absence of any action by Congress, have in such matters, such a radical departure from the previous policy of the government would have been manifested by clear and explicit language. In the absence of such language it should not be assumed that any such departure was intended."

In Montgomery against Portland the harbor line had been fixed by the Port Commissioners under authority given them for that purpose.

Montgomery wished to build out beyond the harbor line so fixed, and he went to the Secretary of War and got a United States harbor line put outside of the harbor line which was established by the State authorities, and then got permission to erect his wharf. The city objected. The Supreme Court, reviewing previous decisions, decided that the Secretary of War's permission and the establishment of the line outside did not give the Secretary of War any authority to permit Montgomery to build beyond the harbor line established by the State.

Fifth. — That this limitation of the scope of inquiry by the Secretary of War is the true intent of the acts of Congress and needs no enlargement, and accords with wisdom, cannot be questioned. It rests upon the fundamental principles of local self government. The very essence of the question is local. The vessels would not visit the locality unless to unload or ship a cargo for a local shipper or consignee.

But apart from the principle involved, it would be impolitic and undesirable to impose on the Secretary of War, in addition to all his manifold duties, the burden and responsibility of revising the findings of local tribunals upon multitudinous facts of purely local interest, as to whether the public interest and welfare of a locality were to be benefited or injured by a proposed public improvement. It is submitted that not only the unnecessary increase of the burdens of that department would be a powerful argument against any other interpretation of the meaning of the act than the one contended, but that it is against the public policy of the country to transfer local questions wholly dependent upon local prejudices and interests to a department at Washington.

Escanaba v. Chicago, 107 U. S. Rep. 678, 683, is commented on in the opinion in *Cummings v. Chicago*, as follows: The question was as to the validity of regulations made by the city of Chicago in reference to the closing, between certain hours of each day, of bridges across the Chicago River. Those regulations were alleged to be inconsistent with the power of Congress over interstate commerce. This court said: "The Chicago River and its

branches must, therefore, be deemed navigable waters of the United States, over which Congress, under its commercial power, may exercise control to the extent necessary to protect, preserve, and improve their free navigation. But the States have full power to regulate within their limits matters of internal police, including in that general designation whatever will promote the peace, comfort, convenience and prosperity of their people. This power embraces the construction of roads, canals and bridges, and the establishment of ferries, and it can generally be exercised more wisely by the States than by a distant authority. They are the first to see the importance of such means of internal communication, and are more deeply concerned than others in their wise management. Illinois is more immediately affected by the bridges over the Chicago River and its branches than any other State, and is more directly concerned for the prosperity of the city of Chicago, for the convenience and comfort of its inhabitants, and the growth of its commerce. And nowhere could the power to control the bridges in that city, their construction, form and strength, and the size of their draws, and the manner and times of using them, be better vested than with the State, or with the authorities of the city upon whom it has devolved that duty."

Here Boston might be substituted for Chicago, and that language could be applied to the case at bar with controlling influence.

Sixth. — In the case before you no objections have been heard against the location or the form of the proposed structure. The plans have been prepared by one of the most skilful bridge engineers in the Commonwealth, if not in the country, with minute and careful reference to the conditions and requirements of the structure and its surroundings, and after full hearing, at which everybody desiring had an opportunity to be heard, and after consideration of all public and private interests concerned, have been approved by the State and municipal authorities and by the local boards, chambers and associations who make it their business both to promote and guard the interests of commerce and navigation.

The only question which should interest the Secretary of War is whether the proposed structure, in form and location, would unreasonably interfere with navigation, — and evidently the word *location* is limited in the view of the court to the location of things within the bridge itself, for instance, the piers relative to the tidal way through, or the height above the tidal way and the location and width of the draw opening. Those are all questions which properly, under the act of Congress, may be supervised by the

Secretary of War and may be changed; but beyond that I do not think it was the intention of Congress to go, and I think that the decisions of the Supreme Court of the United States have finally settled that limit.

THE COMMONWEALTH'S FLATS AT EAST BOSTON.

The question involving the title of the East Boston Company to certain of the flats at East Boston, taken by the Commonwealth under chapter 486 of the Acts of 1897, is still pending in the Land Court.

The commission on the separation of grade crossings at East Boston has finally reported in favor of the plan advocated by the Boston & Albany Railroad Company, which permits its tracks to remain substantially in the location heretofore occupied through the centre of the island; in consequence whereof the flats heretofore taken by the Commonwealth from the East Boston Company fail to receive the benefit which a relocation of the railroad tracks on the east side of the island would have given.

The total amount expended on account of this property, up to Dec. 1, 1904, is \$24,988.79.

SOUTH BAY.

On April 8, 1904, the Board entered into a contract with the Roxbury Central Wharf Company to dredge a channel across the southerly end of South Bay, in extension of the channel dredged by the Commonwealth in 1902, about 375 feet long, 110 feet wide on the bottom and 12 feet deep at mean low water; the contract price being \$8,000 and the date of completion June 1, 1905. No substantial amount of work has been done.

In order to provide for the payment of a judgment rendered in February, 1904, against the Commonwealth in the case of *Wm. H. Bent v. Commonwealth of Massachusetts*, for land taken in South Bay for the purpose of its improvement by dredging, chapter 63 of the Resolves of 1904 was passed, allowing the sum of \$10,500 to be taken from "Improvement of South Bay in the city of Boston fund," created by chapter 278 of the Acts of 1898.

The total amount expended from the above fund up to Dec. 1, 1904, is \$48,503.70. The balance in this fund on Nov. 30, 1904, was \$10,933.80.

MYSTIC RIVER.

In the report of the Board for 1901 it was stated that "claims for displacement by filling on the west side of the river have been made up and put into the Attorney-General's hands for collection. These claims are liable to be contested, on the ground that prior legislation has exempted the owners of flats on that side of the river, within a limited territory, from the payment of compensation for tide water displaced. These contentions raise questions of law which it will be necessary to take to the Supreme Judicial Court for decision, before the rights and obligations of the Commonwealth and the contending parties can be ascertained and settled."

The cases of the Commonwealth against Stone and Metcalf, relating to payment of certain assessments for tide water displaced by filling in Mystic River on a portion of the territory lying between Johnson's wharf and Elm Street, in Charlestown, and involving questions of law referred to in the above report, were decided adversely to the Commonwealth by the Supreme Judicial Court in February last on the ground that St. 1893, chapter 334, was an extension of the right to fill the defendants' lands without paying for the displacement of tide water, which was originally granted to the Mystic River Corporation, and that this extension granted in terms to the defendants and others who were in possession inured to their benefit in such a way as to exempt them from the provisions of Public Statutes, chapter 19, section 14.

MERRIMAC RIVER HARBOR LINE.

In July, 1904, the Board heard parties interested in a petition for license to build a wharf on the northerly shore of Merrimac River in Haverhill within that section of the city frontage on which no harbor line has been established. The question of permitting a structure to extend into the river beyond the bank as far as desired by the petitioner in

this case, and the expediency of having a known limitation binding upon all adjacent estates, alike leads the Board to recommend to the Legislature the advisability of extending the harbor line fixed by chapter 313 of the Acts of 1902 in a general easterly and south-easterly direction to a point opposite Buttonwoods Avenue.

ANNISQUAM RIVER.

In accordance with the provisions of chapter 71 of the Resolves of 1903, a survey was made of Annisquam River in that year, also estimates of the cost of improving the channel.

The project provided for dredging a channel with a depth of not less than 6 feet at mean low water from the head of the present 6-foot channel opposite Wolf Hill, through the cut into Gloucester harbor, this channel to be 100 feet wide on the bottom from the end of the present 6-foot channel up to the entrance of the cut, thence 60 feet wide on the bottom through the cut into the harbor. The Board reported that this improvement would involve the expenditure of \$75,124.

By chapter 88 of the Resolves of 1904 the project was approved in modified form, limiting the cost to \$50,000, to be expended at the rate of not over \$17,000 a year, and the dimensions of the channel between Gloucester harbor and Wolf Hill, or thereabout, according to the plan made by the Board under the provisions of chapter 71 of the Resolves of 1903, to the width of not exceeding 50 feet, with a depth of not exceeding 6 feet at mean low water.

In furtherance of this project the Board prepared and forwarded for signature certain releases, and communicated with the city engineer of Gloucester in respect to the highway bridge known as Cut bridge across this river, as the carrying out of the improvement involves the rebuilding of this bridge as well as the strengthening of the foundations of the Boston & Maine railroad bridge. Subsequently, conference was had with the mayor of Gloucester and others interested, at which it appeared that no plans had been adopted by the city of Gloucester for rebuilding the highway bridge. The railroad company has signified its willing-

ness to make the desired changes in its bridge, but the Board is awaiting action by the city of Gloucester before completing its plans and advertising for proposals.

The total amount expended on the project for the improvement of this river, up to Dec. 1, 1904, is \$1,399.28.

BASS RIVER, BEVERLY.

By chapter 341 of the Acts of 1903 the Board was directed to dredge the channel of Bass River, in Beverly, from Isabelle's Island, near Elliott Street, to the mouth of that river at its junction with Danvers River, to a depth of 18 feet at mean high tide, the channel to be made 100 feet wide wherever in the judgment of the Board it is practicable, and at the end nearest Elliott Street may, in the discretion of the Board, be made of greater width.

It was estimated in 1903 that the total cost of the work would be about \$85,000. Section 4 of the act provides for the payment by the Commonwealth of \$25,000 for dredging and damages that may be awarded under section 2 of the act. The excess above \$25,000 is to be paid by the city of Beverly.

On Feb. 2, 1904, a contract was entered into with Charles H. Souther and John H. Gerrish to dredge a channel about 6,500 feet long, 100 feet wide on the bottom and 9 feet deep at mean low water, except that where ledge is encountered the channel through the rock is to be excavated 75 feet wide on the bottom and at least 9 feet deep at mean low water.

The contract provided for the completion of the whole work by Oct. 30, 1904, the price for dredging the channel and disposing of the material being $33\frac{1}{2}$ cents per cubic yard, scow measurement; and for excavating ledge and disposing of the material \$11.40 per cubic yard, measured *in situ*.

Owing to delay, partially due to the reconstruction of the bridge over this river, the work will not be completed until the summer of 1905.

At the present time, with the exception of a small amount at the mouth of the river, the channel has been excavated up to within about 1,000 feet of its terminus, but the rock removal has not been commenced. Up to Dec. 1, 1904, 128,200 cubic yards of material have been dredged, of

which 84,240 cubic yards have been deposited in deep water in the outer portions of Salem harbor and the balance used for filling the wharves on the banks of Bass River.

The total amount expended up to Dec. 1, 1904, is \$33,640.99, of which \$24,203.27 has been paid by the Commonwealth and \$9,437.72 by the city of Beverly.

CONNECTICUT RIVER.

By chapter 344 of the Acts of 1885 this Board was given the general care and supervision of the Connecticut River and its banks, and of all structures therein, to prevent and remove unauthorized encroachments and causes of every kind which may in any way injure the river, and to protect and develop the rights and property of the public therein.

Hadley. — In 1888 an appropriation of \$15,000 was made for building protective works to prevent further inroads of the river upon the northerly side of Hadley. The work done under this appropriation was the grading of the bank above the water line to a uniform slope, the covering of the slope above and below the water line with mats constructed of willow, brush and poles, and the placing of rubble stone and riprapping over the mats. Willows were also set in the slope above the low-water line, and have since grown into the banks, thus by the spread of their roots affording additional protection. The method of construction adopted by the Board has been fully described in preceding reports.

Additional appropriations for protective works in Hadley have been made as follows: —

Resolves of 1889, chapter 17,	. . . . .	\$15,000
Resolves of 1900, chapter 100,	. . . . .	15,000
Resolves of 1901, chapter 94,	. . . . .	15,000
Total appropriations,	. . . . .	60,000

In 1902 a dike was built where the river had broken through the bank, just below the bridges crossing the river between Northampton and Hadley, at a cost of \$1,731.54.

In 1903 and 1904 the riprapping on the bank was reinforced where it had been undermined and displaced, and where it had settled, at a total cost of \$4,159.83.

The total length of river bank which has been treated thus far is about 5,200 feet.

The total amount expended at Hadley up to Dec. 1, 1904, is \$60,864.41, a portion of which has been paid from appropriations for repairing damages along the coast line or river banks of the Commonwealth.

West Springfield.—By chapter 90 of the Resolves of 1891 an appropriation of \$5,000 was made for protective work to prevent further inroads of the river upon the easterly side of the town of West Springfield and the destruction of property. The bank of the river to the extent of about 210 feet was treated, on practically the same plan and by the same methods adopted at Hadley.

The total amount expended at West Springfield up to Dec. 1, 1904, is \$4,916.49.

Agawam.—By chapter 101 of the Resolves of 1894 an appropriation of \$2,000 was made for protective works along the western bank of the river in Agawam. Additional appropriations for protective works at this place have been made as follows:—

Resolves of 1895, chapter 67,	. . . . .	\$3,000
Resolves of 1896, chapter 95,	. . . . .	1,500
Resolves of 1897, chapter 58,	. . . . .	1,500
Total appropriations,	. . . . .	8,000

This work was done in 1894–97, substantially on the same plan and by the same methods used at Hadley and West Springfield, resulting in the protection of about 2,400 feet of the river bank.

The total amount expended at Agawam up to Dec. 1, 1904, is \$8,005.76.

Hatfield.—By chapter 82 of the Resolves of 1903 an appropriation of \$7,500 was made for protective works at Hatfield to further prevent inroads and encroachments of the river along the western bank. The Board, as stated in its report of last year, after an inspection and study of the locality and existing conditions, concluded to build two connected earthen dikes 10 feet in width at the crest, with

side slopes of $2\frac{1}{2}$ to 1, to prevent further encroachments, and on June 2, 1904, entered into a contract with Kiely & Gleason to build the same, also to furnish and lay pipes for drainage through or under the dikes, and to protect the outlets with bulkheads of stone masonry and with paving. The work was completed in November, 1904.

The total amount expended at Hatfield up to Dec. 1, 1904, is \$5,110.24.

The total amount expended up to Dec. 1, 1904, in protecting the Connecticut River banks in Hadley, West Springfield, Agawam and Hatfield, is \$78,896.90.

GREEN HARBOR.

By chapter 495 of the Acts of 1896 the Board of Harbor and Land Commissioners and the State Board of Health were constituted a joint board to investigate and report on Green Harbor in the town of Marshfield.

In accordance with the recommendations of the joint board, made in its report to the Legislature in 1898, an appropriation of \$67,000 was made in that year for the improvement of Green Harbor below the dike by excavating an anchorage basin within the point of Duxbury Beach, and opening a channel from the basin to the sea, the entrance to be protected by stone jetties.

A contract for the construction of two stone jetties, with an opening of about 200 feet between their outer ends, was entered into Sept. 27, 1898, with the Rockport Granite Company of Massachusetts, and they were completed in the fall of 1899 at a cost of \$33,256.93. A timber wall to direct the current of Cut River flowing into Green Harbor, and thus assist the main current in keeping the entrance clear, was completed in February, 1900.

A contract with Augustus B. Martin to dredge the channel between the jetties to 5 feet at mean low water, with a width of 60 feet on the bottom, and to excavate an anchorage basin just inside the Narrows, about 350 feet by 300 feet, to the same depth as the entrance channel, was made and completed in 1900 at an expense of \$26,073.79. In this year the timber bulkhead previously built at the

inner end of the westerly jetty was extended alongside the jetty, to act as a sand catch and thus increase the height of the beach and prevent waves washing over the beach into the new channel. Boulders were also removed at the entrance of the channel.

By chapter 393 of the Acts of 1904 the Board was directed to dredge Green Harbor River, in its discretion, to such depth as it might determine to be needful, and authorized to expend therefor not exceeding \$10,000.

A survey and examination of the harbor were made in June, 1904, showing that the location of the channel, which had been dredged to a width of 60 feet on the bottom and depth of 5 feet, had changed and the same had filled to a considerable extent, and that the channel from the anchorage basin to the sea had a depth ranging from 4 feet at mean low water to $1\frac{1}{2}$ feet, and a width varying from 60 feet to 110 feet between the low-water lines. The anchorage basin has shoaled considerably and the westerly jetty has settled. At the present time boats drawing 18 inches can pass in and out of the harbor at ordinary low water, and this appears to be about the size of channel which the present tidal volume of the harbor will maintain with the jetties as now built.

No contract for the dredging authorized by the act of 1904 has been made, as it is considered inadvisable before the jetties are built up.

The total amount expended for the improvement of Green Harbor since beginning work in 1898, up to Dec. 1, 1904, is \$65,961.42.

STAGE HARBOR.

The Board, acting under authority of chapter 47 of the Resolves of 1903, prepared plans and specifications during that year for building a timber dike and structures in the breach at the eastern end of Stage harbor in Chatham, to protect the harbor from encroachments or damage by the sea, the appropriation therefor being \$5,000. The only proposal received for this work was 50 per cent. greater than the amount appropriated, and was rejected.

By chapter 90 of the Resolves of 1904 the Board was authorized to expend \$1,000 for building the structures

authorized by chapter 47 of the Resolves of 1903, in addition to \$5,000 appropriated by the latter resolve.

On July 21, 1904, proposals were received for building a timber bulkhead or dike across the channel through the marsh into the eastern end of the harbor, and for extending the structure across the marsh to the sand dunes on either side, together with timber fences supported by embankments of sand to close the valleys through the sand dunes to the south of the main dike.

Before the proposals were received some of the inhabitants of Chatham remonstrated to the Board on the ground that changes had recently taken place which rendered it inadvisable, in their opinion, to build the structures. The outer beach since the last season had built up and connected with the main land on the southerly side of the entrance to Pleasant Bay, thereby greatly reducing the flow of water through the breach into Stage harbor.

After inspection the Board concluded that such changes had taken place in the movement of sand as to avoid immediate menace to the harbor, and that it would consequently defer action for the present and watch for such changes as may occur.

The total amount expended up to Dec. 1, 1904, is \$135.44.

RED RIVER, OR BUCKS CREEK, CHATHAM.

By chapter 102 of the Resolves of 1904 the Board was authorized and directed to construct a timber jetty at the mouth of Red River in Chatham, if in its opinion it is expedient so to do. The expenditure of \$1,000 was authorized by the resolve.

An examination and survey of this locality were made in June, 1904, and it was subsequently concluded to invite proposals for the construction of a timber jetty about 150 feet long on the westerly side of the mouth of Red River, otherwise known as Bucks Creek.

A large fishing fleet harbors at this haven and the project is calculated to protect its interests and enhance its safety.

On Aug. 2, 1904, the Board entered into a contract with

Thomas & Connor to build this jetty, the contract price being \$5.50 per lineal foot. Upon the completion of the contract 156 lineal feet of jetty will have been built, at an expense of \$858, making the total cost of this improvement \$1,091.10, of which amount a portion will be paid from the appropriation for survey and improvement of harbors.

The total amount expended up to Dec. 1, 1904, is \$194.60.

WITCHMERE HARBOR.

The entrance to Witchmere harbor at Harwichport has been improved by the extension, under chapter 463 of the Acts of 1899, of the stone jetty which was in existence in 1899, and by building a timber jetty, about 250 feet long, on the easterly side of the entrance parallel with and 100 feet easterly of the stone jetty.

The Board reported in 1902 that the channel had deepened slightly, but that there was not sufficient depth to enable large boats to enter the harbor. By chapter 91 of the Resolves of 1904 the sum of \$3,500 was appropriated for improving this harbor by dredging the channel and in such other manner as it may be deemed best, provided, however, that the town of Harwich or the citizens thereof should, before work was commenced, deposit not less than \$500 with the Treasurer of the Commonwealth to complete the same. A survey was made in June, 1904, and it was estimated that the cost of excavating and protecting the proposed channel would be not less than \$4,000.

The Board was informed by the State Treasurer on Sept. 1, 1904, that \$500 had been paid under the above resolve.

Owing to the late date at which the deposit was made it was deemed inadvisable to do the work this year. Plans and specifications, however, have been prepared and proposals will shortly be advertised.

The total amount expended on this harbor up to Dec. 1, 1904, is \$4,975.46.

EAST BAY, OSTERVILLE.

By chapter 376 of the Acts of 1903 the Board was authorized, if deemed advisable, to cut a channel or opening from Nantucket Sound into East Bay, at Osterville, and construct jetties for the protection thereof. The sum of \$6,500 was appropriated for this improvement.

After examination a contract was entered into Dec. 29, 1903, with Samuel N. Ames, Joseph P. Hallett and Jehiel R. Crosby, to excavate a channel through the beach into Nantucket Sound, to build two stone jetties, to riprap with stone the banks of the cut through the beach, also to close by a temporary dam the existing outlet to the Sound; the cut to be 175 feet wide on the bottom, with side slopes not steeper than 2 to 1; the jetties to be 250 feet apart between the centre lines, the easterly one to be 100 and the westerly one 250 feet long.

This work was completed in May, 1904, and the current has since deepened the channel so that it is from 4 to 6 feet deep at mean low water between the jetties and extends with somewhat less depth out over the bar so that boats of 2 feet draft can enter and leave the bay at all stages of the tide. Since the completion of the jetties the beach for a short distance to the eastward of the easterly jetty has been protected by riprap. The result of the whole work is a deeper and straighter entrance to the bay. Changes are occurring and it is expected that a better channel than the one through the old outlet of the bay will be scoured and maintained in the future.

No material change has taken place inside the bay, but since the opening of the new cut the sand beach east of the new entrance has built out more than half way across the old outlet. The temporary sand bag dam which was built to close the old outlet and direct the current through the new one broke down and washed away, owing to the decay of the bags during the summer.

At the outer end of the western jetty, which is exposed to the heaviest waves, the stones have been somewhat displaced but not sufficiently to affect the permanence of the

work; but if any extension is built in the future it should be faced with larger stones.

The total amount expended at East Bay up to Dec. 1, 1904, is \$6,618.10.

WEST BAY, OSTERVILLE.

In April, 1904, a survey was made of the channel through the West Bay at Osterville, which had been excavated in 1903 under the authority of chapter 491 of the Acts of 1902.

It was found that the channel remained substantially as dredged except at the inner end of the jetties, where a bar had formed nearly across the channel substantially in the same location as it had formed in previous years; the channel through the jetties had increased in depth somewhat, the jetties themselves had suffered by the washing out of a number of planks, which had been eaten off by the worms, and by the loosening of many others. The planks which were missing were replaced and an additional stringer bolted on to the piles just above the low-water stringer throughout the length of both jetties, and the planks securely spiked to it. With these repairs it is anticipated that the timber jetties will last for some time longer. The expense of this work-up to Dec. 1, 1904, amounts to \$426.74.

The shoal which now extends nearly across the channel just inside the jetties is caused by the high velocity of the flood tide, due to the narrow opening between the jetties. If the jetties were placed farther apart, so that the velocity of the current was reduced, it would not scour out the sand from the bottom of the channel between the jetties on the flood tide and deposit it as it now does where the velocity decreases as the water spreads out in the open bay.

The sand which is thus scoured from the bottom of the channel between the jetties is supplied largely from the beach to the eastward of the jetties, and is sifted through breaks in the jetty where planks have been washed out. If the jetty is maintained intact this source of supply is cut off and the ebb current will tend to gradually wash away the shoal. From examinations made this fall and the testimony of boatmen who have used the cut it would appear that this

is already taking place, owing to the repairs which were made last fall by replacing planks in the eastern jetty, and which have resulted in stopping the supply of sand. It is too early as yet to determine to what extent the ebb current will restore the channel, but from what has already occurred it is probable that if the jetties are kept in repair the channel in the bay will continue to improve.

The total amount expended at West Bay up to Dec. 1, 1904, is \$29,053.44.

COTUIT HARBOR.

By chapter 358 of the Acts of 1904 the Board was directed to make a preliminary examination, and, if considered expedient, to deepen and improve the entrance channel from Nantucket Sound into Cotuit harbor by removing rocks and excavating a channel, or in such other manner as deemed best, — the appropriation therefor being \$5,000.

In June, 1904, a survey and examination of the harbor were made. The channel across the bar at the entrance was obstructed by stones and bowlders dangerous to navigation in small boats. The limited appropriation was sufficient to remove the obstructions from the bar, but inadequate to excavate a channel of the dimensions and depth commensurate with the use of this harbor by yachts. On July 29, 1904, a contract was entered into with Ruggles & Perkins to remove the obstructions and make a fair way about 400 feet wide, the contract price being \$11 per cubic yard. This work was completed Oct. 3, 1904, 167 cubic yards of rock having been removed, at a cost of \$1,837.

The Board was urged to dredge a narrow channel across the bar in addition to the removal of the rocks, but no satisfactory arrangements could be made with the balance of appropriation, and even if done it would be largely in the nature of an experiment and of doubtful permanency.

From the survey made a considerable change appears to have taken place in the outer channel of Cotuit harbor since 1897. This channel, which has been used for a number of years as the main entrance channel, has shoaled very materially, and at the bend near the Rushy Marsh, so called, where it is very narrow, it has shifted a considerable dis-

tance nearer the shore. The channel whence the rocks have been removed, now being more generally used, has substantially the same depth of water across the bar as the Rushy Marsh channel and is much more direct.

The harbor of Cotuit was formerly the home port of a considerable number of coasting vessels which wintered there, as they no longer do because the entrance is too shoal for the increased size of vessels. The main entrance, which formerly was between Dead Neck and Sampson's Island, has now been practically closed by the building out of Dead Neck Beach. Since then the main approach was for a time by way of the Rushy Marsh channel above described, but now that is nearly closed, so that before long the only remaining channel is likely to be across the wide sand flat from which the rocks were removed the past summer.

This flat and the channels between it and the harbor are exposed to all winds from south-west to south-east, which are continually shifting the sand and tending to level the shoals into the channels and anchorage basins.

The improvement desired is the excavation of a channel, with a depth of 5 feet or more at low water, from the existing deep water west of Sampson's Island to the deep water of Nantucket Sound. Such a channel if excavated would at once begin to receive deposits from the shoals on either side, and it in time would probably be filled in as the previous channels have been, although for a number of years it would undoubtedly be better than the present one.

The cost of excavating such a channel would be large, and the only way in which it could be made reasonably permanent would be to construct long jetties extending from the shore on either side substantially out to the outer edge of the shoal so as to prevent the sand from being driven from the shoals into the channel and on the other hand to direct the current through the excavation, thereby maintaining it. The cost of such jetties would be more than the benefit to be derived would warrant, and the channel without them would probably be of but temporary value.

The total amount expended up to Dec. 1, 1904, is \$1,973.67.

LAKE ANTHONY.

The construction of a harbor at this place was authorized by chapter 441 of the Acts of 1898, the appropriation therefor being \$5,000.

This amount was considered insufficient to carry out the project in a proper manner and the Board recommended a further appropriation. By chapter 155 of the Acts of 1899 an additional amount of \$15,000 was made available, and a channel was excavated through the beach into the lake, 100 feet in width on the bottom and 5 feet deep at mean low water. The entrance was protected by the construction of two stone jetties, each extending about 200 feet beyond low-water line, the total cost of the work, including surveys and engineering, being \$19,627.13.

In 1900 additional stone was placed at the inner ends of the jetties, under the provisions of chapter 309 of the Acts of that year.

In 1901 an appropriation of \$5,000 was made for dredging and other necessary work, and during the summer the approach to the principal landing was dredged to 5 feet at mean low water and moorings placed in the main portion of the harbor, the total cost of the improvements up to Dec. 1, 1901, being \$24,290.64.

In 1902 the anchorage area was increased by dredging and the material used to cover the flats, which were considered unsanitary.

By chapter 416 of the Acts of 1904 the Board was authorized to continue the improvement of Lake Anthony by increasing the size and depth of the entrance and the anchorage basin, \$10,000 being appropriated therefor.

It was found upon examination that some shoaling had taken place in the entrance channel, due to the sand being driven through the spaces between the stones forming the jetties and riprap, and in order to prevent a recurrence the jetties have been made sand tight so far as possible by filling in the spaces with cement concrete.

On July 29, 1904, a contract was entered into with John H. Gerrish to dredge the entrance and the anchorage basin,

the contract price being \$8.50 for each full hour that the dredging machine is actually engaged in dredging. This work will be completed in December, 1904, and will result in the deepening of the entrance to 7 feet at mean low water for a width of 75 feet through the centre, and in the addition of $7\frac{1}{2}$ acres to the area of the anchorage basin dredged substantially to 6 feet at mean low water.

The riprap along the inner end of the northerly side of the entrance channel has been set back and the channel widened, to give more room for the passage of boats.

The mooring buoys set by the Commonwealth are in good condition. The harbor is largely used as an anchorage basin for yachts and fishing craft, and also as a harbor of refuge. The expenditure for the season up to Dec. 1, 1904, was \$3,681.80.

The total amount expended at Lake Anthony up to Dec. 1, 1904, is \$30,518.08.

VINEYARD HAVEN HARBOR.

By chapter 95 of the Resolves of 1904 the Board was directed to examine and in its discretion to make or cause to be made a survey and estimate of the cost, best method and advisability of constructing a stone breakwater on the westerly side of Vineyard Haven harbor, to protect the anchorage ground used by fishing boats and other small craft.

A survey was made of this portion of the harbor in July and August, 1904, and on October 13 the Board inspected the premises and gave a hearing at Vineyard Haven. The testimony tended to show that some protection was needed for fishing boats and yachts, but the speakers did not agree as to the best method of furnishing it.

It was the general opinion that a breakwater should be built in the most convenient locality. Most of the boatmen desired to have the breakwater extend from some point in the vicinity of Lord's wharf south-easterly toward the red buoy near the steamboat wharf, leaving a comparatively wide entrance at the northerly or shore end, and to build in addition a short spur jetty extending from the land a suf-

ficient distance to stop the drift of sand along the beach. A breakwater built in this location would enclose practically the whole of the shoal ground on the westerly side of the harbor, but being located almost wholly on the outer edge of the flat the structure would have throughout its length the maximum cross section, thereby making it the most expensive protection that could be erected; and in addition the area inclosed would be, according to the evidence, very much greater than required to accommodate the largest number of boats likely to seek the harbor.

Another proposition was to start near the end of Arnoux's wharf and extend south-easterly to a point about north-east of the end of the steamboat wharf. The axis of a breakwater in this location would be practically at right angles to north-easterly gales, and an area sufficiently large to accommodate all the boats which usually would make a harbor here would be well protected. This breakwater could also be built at much less than half the cost of one in the first location because of being more nearly at right angles to the shore, and for the reason that a large part of the inner end would be located in comparatively shoal water.

The cost of a breakwater 1,200 feet long off Arnoux's wharf would be about \$20,000. One in the location first described, as it would be more than twice as long and of considerably greater cross section, would be more than double that sum.

Some testimony tended to show that a better harbor for boats and smaller vessels could be made by opening the entrance to the Lagoon Pond, on the easterly side of the harbor. This pond has an area of about 296 acres, with ample depth at mean low water, but at the present time its entrance is crossed by a highway and bridge, and the depth on the bar across the entrance is less than 2 feet at mean low water.

To make the pond available as a boat harbor it would be necessary to excavate the entrance to a depth of about 10 feet at mean low water and a width of about 300 feet, and in addition to dredge away a considerable area of the sand flats now lying in front of the entrance. After excavating

the entrance its banks should be riprapped with stone, and short jetties built on each side extending into the harbor. In order to prevent the shoal forming again it would be desirable to protect the beach for a considerable distance northerly from the opening. The highway between Vineyard Haven and Cottage City, destroyed by cutting through the beach, should be replaced by one crossing the lagoon at a point higher up, say about two-thirds of the way from the entrance to its head. By such a new highway the distance between the two villages would be practically the same as at present. By the construction of a bridge without a draw across the lagoon about 132 acres of its upper or southerly end would be cut off and boats with masts would be barred from entering it, but below the bridge would be an area available as a harbor of about 164 acres with a depth ranging from 5 to 20 feet at mean low water. In addition to this the smaller boats could lie on the flats south of the beach and west of the deep water of the main portion of the pond.

The existing highway from Cottage City to Lagoon Heights is already graded and paved with tar concrete; that portion, however, from the heights across the lagoon would have to be laid out and constructed. From Lagoon Pond across the hill by the Marine Hospital to the village of Vineyard Haven a highway is already laid out and partially graded. The grading and surfacing of this highway would have to be completed. The cost of completing the highway, dredging the entrance to Lagoon Pond and constructing the jetties at the entrance with protective works along the shore of Vineyard Haven harbor to the north of the proposed entrance, in a substantial manner, would be not less than \$70,000.

The boatmen at Vineyard Haven are practically unanimous in their feeling that the breakwater suggested by them is the only thing which would give them adequate protection, together with the convenience desired in prosecuting their work. They argue that the anchorage in Lagoon Pond is too far away from the business portion of Vineyard Haven and their homes. They prefer to have

the breakwater located as far down the harbor as possible, as many of them live in the northern portion of the village. Some of them said that if any other project is to be adopted instead of the proposed breakwater they would prefer to have Tashmoo Pond opened, as it is nearer the fishing grounds than Vineyard Haven harbor and it is not a great distance to walk across from the pond to the village, but they prefer the breakwater to this.

The people who are mainly interested in coastwise commerce favor the opening of Lagoon Pond as a much better solution of the problem than a breakwater in the open harbor, arguing that in heavy north-easterly gales light draft vessels dragging anchors or breaking from moorings would be in danger of driving on to a stone breakwater where there would be greater risk of being dashed to pieces than if simply drifting on to the sand flats. They also argue that if the pond is opened to navigation it would bring into the market a large area of water front now practically cut off from access to the sea, which would be very valuable, and that owing to the depth and area of the pond it would be readily available for vessels of considerable size.

The project was favorably mentioned as practicable and not very expensive by the late Prof. Henry Mitchell in his report to the superintendent of the United States Coast Survey, 1869.

The protection needed at Vineyard Haven is from north-easterly gales. In all ordinary weather a breakwater would not be wanted. Its existence would by many be considered a menace to safe anchorage in bad weather. There would be danger that the growth of the sandy flat, or spit which lies between its projected easterly end and the shore, might be deflected into the channel, thus closing the approach to the steamboat wharf. The needed protection could be given by an opening into the lagoon. All small boats anchoring in the harbor would seek shelter by running free through the opening. According to the evidence there might be from 25 to 100 such craft at times needing shelter. Inside the lagoon there would be anchorage also for a large number of coasting vessels drawing not more than 15 to 18 feet.

Under the circumstances and conditions existing the Board would not consider it advisable to build the proposed break-water, but suggests that Congress be asked to approve the project of making an entrance into the lagoon and an appropriation to cover the cost thereof.

The total amount expended by authority of chapter 95 of the Resolves of 1904, up to Dec. 1, 1904, is \$234.97.

MENAMSHA INLET.

Menamsha Inlet is on Martha's Vineyard in the towns of Gay Head and Chilmark. By chapter 323 of the Acts of 1897 the Board was directed to locate and mark the boundary line between the above-named towns as established by this act, and whenever one or more of the inhabitants of said towns should agree, with such sureties as would be satisfactory to the Board, to close the existing outlet of Menamsha Pond and to excavate a new one through the beach on said boundary line, in a location and in a manner to be approved or prescribed by the Board; then this Board was authorized and directed to build a suitable protection to the banks on each side of the new outlet and extending into Vineyard Sound for the purpose of fixing the location of said outlet and there marking said boundary lines. An expenditure of \$2,000 was authorized.

By chapter 357 of the Acts of 1898 a further appropriation of \$2,000 was made for carrying out the provisions of the act of 1897, and in 1898 two pile and timber jetties were built to protect the banks of the inlet.

One of the jetties having received injury by a violent storm, an additional appropriation of \$5,000 was made by chapter 133 of the Acts of 1899, and in that year the jetties were strengthened by the placing of 2,110 tons of stone, at a total cost of \$4,916.30.

In 1900 a timber bulkhead was built across the beach to act as a sand-catch, and about 300 tons of stone placed in the westerly jetty, at an approximate cost of \$978.95, paid from the appropriation for the survey and improvement of harbors under chapter 309 of the Acts of 1900.

In 1902 the westerly jetty was repaired by closing with

concrete the holes between the large stones, and in addition a short wing wall of concrete was built, at a total cost of \$478.49.

By chapter 394 of the Acts of 1903, the improvements already made having increased the harbor facilities, a further appropriation of \$10,000 was made for dredging the channel between the jetties and across the flats and for building such structures as might be necessary, the channel to be not less than 3 feet deep at mean low water and of such width as the Board should determine. Under this authority a channel was dredged about 1,600 feet long, 75 feet wide on the bottom and 5 feet deep at mean low water, at a cost of \$8,250. This work was completed in October, 1903.

As a protection to the banks of the new channel about 700 tons of stone riprap were placed thereon. A timber fence was also built along the crest of the beach. The total cost of this additional work was \$1,673.42.

In July, 1904, a survey was made of the channel which was excavated in 1903 under the provisions of chapter 394 of the Acts of that year. It was found that the inner end of the channel had been partially filled by material washed down from the flats in the upper portion of the stream, and that the steep banks left by the dredge had also been flattened out to a certain extent, thus shoaling the channel. At the time of the survey there was a channel with a navigable depth of not less than 3 feet of water at mean low tide through the entrance and two-thirds of the way toward the upper end of the dredging.

The timber work of the jetty on the westerly side of the entrance was very badly damaged by storms, most of the planks having been washed away. The stonework was in good condition but had settled so that it was practically covered at high tide for the outer half of the jetty. The timberwork on the easterly side was in fairly good condition. Considerable sand washed into the channel through the stonework of the westerly jetty toward its upper end, but being carried out with the ebb tide had not materially decreased the navigable depth. The westerly jetty should be built up with stone in order to more effectually protect the entrance.

The creek has been largely used throughout the year by fishing boats. During the heavy gale about the 1st of September a number of fishing boats which remained outside the harbor over night were driven ashore on the beach, while those which ran into the harbor were uninjured.

The total amount expended at Menamsha Inlet up to Dec. 1, 1904, is \$20,498.73.

BASS RIVER AT SOUTH YARMOUTH.

By chapter 113 of the Resolves of 1901 the Board was directed to improve the channel of Bass River, and an appropriation of \$22,000 was made for the purpose. On Nov. 14, 1901, a contract was entered into with Augustus Bellevue & Co. for the construction of two timber jetties, one on either side of the river mouth, and for dredging a channel between them, across the flats, to the depth of 4 feet at mean low water. This work was completed Oct. 16, 1902, the westerly jetty being 950 and the easterly 2,423 feet long. The total cost of this improvement, including superintendence and engineering, was \$22,800.50.

By chapter 46 of the Resolves of 1903 an appropriation of \$15,000 was made to complete the improvement of the channel, and in that year a contract was entered into with John H. Gerrish to excavate the same and deposit the material on the banks back from the sides of the channel for the sum of \$6,500. The total cost of this improvement up to Dec. 1, 1903, including surveys and repairs, was \$31,292.86.

In April, 1904, a survey was made of the channel at the mouth of the river and it was found that it had shifted considerably from the location where it was excavated in 1903, under the provisions of chapter 46 of the Resolves of that year, but that the size and depth were fully equal to the channel as excavated, except at the outer end on the bar, where it had slightly shoaled. Just inside the angle in the eastern jetty the channel had shoaled somewhat, so that there was barely 3 feet at low tide.

During the summer examinations have been made from time to time, and it appears that the channel is gradually

being enlarged and the shoals are working out toward the sea.

During the heavy gales in September, 1904, a portion of the sand bags placed against the outer portion of the eastern jetty were washed out, and it was found that the bank of sand bags which had been placed along nearly the whole length of the outer portion of the eastern jetty had settled and exposed the planks below the sheathing of creosoted boards; also that the current was scouring and deepening the channel alongside this jetty. In order to more thoroughly protect it additional sand bags have been placed alongside and plans and specifications prepared for still further protecting the jetty with stone riprap. At the inner end of the western jetty the sea had cut into the bank to such an extent that it was necessary to protect it, and a small amount of stone riprap was placed there.

The total cost of the work done during the year is \$688.66. The total amount expended in improving the entrance to Bass River up to Dec. 1, 1904, is \$32,045.13.

WRECKS AND OBSTRUCTIONS.

Complaints regarding wrecks have been received by the Board as follows:—

Two wrecks in Dorchester Bay off the southerly shore of South Boston; one of these, on the flats just outside the women's bath house at the foot of M Street, was removed by the Board at an expense of \$50. The other, near the mouth of the bay between South Boston and the Calf Pasture, was not removed.

Hulls of several old scows and schooners lying wholly or partly submerged on the beach between Cunningham and Banks wharf and Meridian Street bridge in Boston upper harbor. No action taken; not interfering with navigation.

A scow lying sunken in Boston upper harbor off Marquand's wharf in East Boston. Removed by the owner after notice from the Board.

Hull of the "Fawn," formerly used as a powder boat, on the beach at Apple Island in Boston harbor. Removed by the owner after notice.

Hull of the schooner "Casco" at Governor's Island wharf, Boston harbor. No action taken; not a menace to navigation.

Sloop "Galena" lying sunken in the north channel of Boston harbor, about 1,000 feet south-east of buoy No. 2. Referred to U. S. government officers.

Dredging machine, lying sunken in Boston harbor near buoy No. 10. Removed by the owner.

Hull of a vessel in South Bay. No action taken; not an obstruction to navigation.

The total amount expended from the appropriation of \$1,500 made by chapter 24 of the Acts of 1904, up to Dec. 1, 1904, is \$50.

PROVINCE LANDS.

The general care and jurisdiction of the Province Lands in Provincetown, comprising about 3,290 acres, was committed to this Board by the provisions of chapter 470 of the Acts of 1893. The bounds of these lands were fixed and marked and the territory shown on a plan annexed to the annual report of the Board for that year. A superintendent was appointed and the work of reclaiming the territory, consisting of three ranges of sand hills, running north-easterly and south-westerly, about one mile in extent each, and with the north-westerly exposure devoid of vegetation, was commenced, with a view to restraining and preventing the drifting of loose sands towards the town of Provincetown and the harbor. The first appropriation was \$2,000 and was applied to the construction of a road to render the territory reasonably accessible, and to the planting of Scotch broom, poplars, willow, larch, pines, maples, oak, birch, beech and berry bearing plants. In 1894 a further appropriation of \$3,000 was made. In 1895 a section comprising about 13 acres was planted with beach grass, to serve as a sand binder. Among the beach grass willow slips were planted, and willow trees of various kinds. Silver poplars and young pines were placed at the foot of the slope and parallel with the beach grass area. The appropriation in that year was \$3,500. In 1896 the work was carried forward upon the same plan as in the previous year, the appropria-

tion also being \$3,500. The road was extended about 650 feet, the total area covered since the beginning of operations in the spring of 1895 amounting to about 29 acres.

The preceding three years determined the policy of the Board regarding the manner of improving the dunes for the purpose of preventing the blowing and drifting of sand. The beach grass proved to be an excellent binder, and the planting of shrubs and trees of the kinds found to thrive in sand without soil and withstand exposure to the fierce winter winds will eventually raise windbreaks, under the protection of which other indigenous vegetation will spring up, and again the region will become covered with plant life. The growth must continue under peculiar hardships, for the heavy winter winds, usually from the north-east or north-west, blow with great velocity and often terrific force, with which the loose sand drifts like snow and vegetation has a hard chance for life. Gale velocities of 50 to 60 miles an hour are not infrequent, and sometimes rise as high as 72 miles an hour.

Notwithstanding the difficulties to be overcome no doubt remains as to effecting such reclamation of the sand barrens as may ultimate in the reforestation of a large section and entire protection from the dangers threatening the town and the harbor from the sands of the public domain.

Appropriations were continued from year to year, until in 1899 the sum of \$10,000 was appropriated, to be spread over a term of three years; again in 1902 the Legislature sanctioned further improvement by another appropriation of \$10,000 for continuing the work, which will be exhausted in June, 1905.

During the period of ten years covered by these appropriations 240 acres have been planted with beach grass, and within that area large tracts have been overspread with shrubs and trees of the kinds best adapted to thrive in this exposed situation. In the past season alone about 12,000 young pines, taken from the nursery and the adjacent woods, and about 30,000 European alders, in addition to bayberry and other bushes, have been set out.

About 75 acres of barren sand dunes remain to be pro-

tected. Among them are included the balance of the centre range and many small sections scattered throughout the reservation, which need attention before becoming enlarged into extensive areas.

It is estimated that another appropriation of \$10,000 will be sufficient to reclaim the whole extent of the sand barrens belonging to the Commonwealth and put the same into condition to be held intact with a small annual outlay.

The road across by Nigger Head to Race Point life-saving station, 10,200 feet in length, was built at an expense of \$3,450, or a little less than 34 cents a running foot, and with small annual repairs may be made to last indefinitely.

It has been thought advisable to permit parties who spent money in making cranberry bogs on the lands to cultivate and pick the same upon payment of a small annual license fee of one dollar an acre. Under this arrangement during the two years last past the sum of \$268.56 has been paid into the State treasury, while the cultivation of the bogs under the supervision of the superintendent has been carried on without injury to the adjoining vegetation. This small income may be slightly increased as time goes on.

The report * of the superintendent of these lands may be found in the appendix.

The total expenditure on these lands up to Dec. 1, 1904, is \$35,217.20.

STATE BOUNDARIES.

Under the provisions of section 4 of chapter 1 of the Revised Laws it becomes the duty of the Board in the year 1905 to examine and inspect all the monuments or other marks defining the location of the boundary lines of the Commonwealth.

The boundaries between Massachusetts and the States of New York, Vermont, New Hampshire and Rhode Island have recently been thoroughly gone over and permanent monuments set up, but the line between Massachusetts and Connecticut is insufficiently marked. This line was examined by the Commission on the Topographical Survey and

* See Appendix B.

Map of Massachusetts in 1898, under the provisions of chapter 39 of the Resolves of that year, and it was found to be very unsatisfactory. In many towns the line had not been perambulated for several years. The portion east of the Connecticut River was surveyed and bounds established by commissioners in 1828, and the portion west of the river was marked in 1803. It was estimated that in 1898 there were about 130 bounds lacking, and about 45 old bounds then on the line which required resetting. The total cost of resurveying and setting new monuments on the line was then estimated at \$14,000. The work of properly defining the line still remains to be done. The State of Connecticut should be invited to co-operate, and share the expense. It is estimated that the cost of inspecting and making minor repairs to the monuments marking the lines other than the Connecticut line will be about \$1,500.

TOWN BOUNDARY SURVEY.

The work of determining the location of town boundaries has continued with the same organization as for the past few years. From the first of April, 1904, to the last of November, two field parties were employed. During the remainder of the year the heads of these parties have plotted the results of their field work in preparation for the next season.

One of the field parties has made the necessary surveys and brought up to date the information required in the towns within Barnstable and Dukes counties, together with a few local surveys in portions of Norfolk and Essex counties.

Another party has been engaged in extending the triangulation for a group of towns lying north and west of Worcester, making local surveys and acquiring necessary information in relation to the adjoining towns at the east.

Surveys have been made over fifty miles of streams and shore lines of ponds, and the location of 103 bounds marking town lines has been determined by triangulation. In the prosecution of the work a number of the boundary lines were found to be very crooked, and in certain cases the town officers expressed a wish that they might be straightened, con-

sequently during the year, after consultation with the town authorities, the Board submitted to 14 different cities and towns for their concurrence plans for changing and straightening portions of the boundary lines between them. They are as follows: Boylston, West Boylston, Berlin, Clinton, Lancaster, Sterling, Marlborough, Hudson, Northborough, Stow, Shrewsbury, Leominster, Lynnfield and Reading. If action in relation to the proposed changes is favorable, the proposals will be submitted to the Legislature in accordance with the provisions of section 7 of chapter 25 of the Revised Laws.

In the new boundary lines established by the Legislature of 1904, stakes were set at the corners by the engineers of the Board, and later the necessary stone monuments for permanently marking the bounds were set by the town authorities.

The office force has continued the work of calculating from the notes of the field parties the positions of town corners, making abstracts from statutes relating to the establishment of town boundaries and preparing the results of the survey for permanent record. Examinations of the early court records have not progressed as rapidly as during the previous year, owing to the time devoted to the preparation of indices to the note books.

Three new atlases, describing the boundary lines of the 26 cities and towns following, viz., Belmont, Burlington, Cambridge, Lexington, Somerville, Waltham, Watertown, Acton, Bedford, Concord, Lincoln, Maynard, Sudbury, Wayland, Weston, Acushnet, Berkley, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, New Bedford, Somerset, Swansea and Westport, have been distributed during the year. Another atlas, describing the boundaries of 11 cities and towns, viz., Dedham, Dover, Foxborough, Medfield, Needham, Newton, Norwood, Sharon, Walpole, Wellesley and Westwood, is nearly ready for delivery. Still another atlas, describing the boundaries of 11 other towns, viz., Ashland, Bellingham, Framingham, Franklin, Holliston, Medway, Millis, Natick, Norfolk, Sherborn and Wrentham, is in course of preparation.

On the first of December, 1904, atlases covering the boundaries of 99 cities and towns out of a total of 353 in the Commonwealth had been completed and distributed, as provided by statute, and an atlas containing 11 additional ones was in the hands of the printer.

In the preparation of the atlases some few changes have been made by which the cost has been slightly reduced.

SALE AND DISPOSITION OF MASSACHUSETTS ATLAS SHEETS AND TOWN BOUNDARY ATLASES.

There has been paid into the treasury of the Commonwealth during the year, under authority of chapter 57 of the Resolves of 1890 and chapter 360 of the Acts of 1900, the sum of \$226.70, received from the sale of Massachusetts atlas sheets and town boundary atlases. Under chapter 360 of the Acts of 1900 two hundred and twelve town boundary atlases have been distributed among the officers of the various cities and towns and others. Under chapter 95 of the Resolves of 1891 one topographical atlas was given to Mount Holyoke College.

INSPECTIONS MADE DURING THE YEAR.

The following inspections have been made by the Board and under its direction :—

1904.

- | | | |
|------|--------|--|
| Jan. | 18. | Sites suggested for location of new drawbridge over Taunton Great River authorized by chapter 462 of the Acts of 1903. |
| Mar. | 10. | East Bay at Osterville; jetties and channel at Bass River, South Yarmouth. |
| Mar. | 29-31. | Cotuit; Osterville; Hyannis; Bass River, South Yarmouth; Witchmere; Harwichport; Red River and Stage harbor, Chatham, — in company with legislative committee. |
| Apr. | 18-20. | East Bay at Osterville; jetties and channel at Bass River, South Yarmouth. |
| Apr. | 27-28. | Jetties at East Bay, Osterville. |
| May | 4-9. | Jetties and channel at Bass River, South Yarmouth; East and West bays, Osterville. |
| May | 10. | Work in progress at Bass River, Beverly. |

1904.

- May 11. Work in progress on the Commonwealth flats at South Boston, — in company with legislative committee.
- May 16. Work in progress at Bass River, Beverly.
- June 4. Site of alleged dumping in Nantucket harbor.
- June 10. Premises of Marblehead Transportation Company in Marblehead, relative to floats of said company.
- June 14. Work in progress at Bass River, Beverly.
- June 21. Premises of the Sylvester Company on Waters River, in Danvers, relative to proposed structure; work in progress at Bass River, Beverly; dumping ground at Hardy's Rocks, Salem harbor.
- June 23. Jetties and channel at Green Harbor, Marshfield.
- June 24. Wharf under construction at Squantum, without license therefor.
- June 24-25. Work in progress on survey of entrance to Cotuit harbor; East Bay, Osterville.
- June 29. Work in progress at Bass River, Beverly.
- July 9. Work done by the Commonwealth on the Province Lands in Provincetown.
- July 11. Protective work in progress, under the direction of the Board, at Hadley, and dike at Hatfield, on the Connecticut River.
- July 12. Sea wall built by the Commonwealth at Stony Beach, Hull.
- July 25. Protective work in progress at Hatfield; also bank of the Connecticut River at Hadley.
- July 29. Site of proposed work at Stage harbor, Chatham.
- July 30-31. Town boundary survey work at Bass River, Yarmouth, and jetties and channel at mouth of the river.
- Aug. 22-24. Work in progress at the entrance to Cotuit harbor; jetties at East Bay, Osterville.
- Aug. 27. Work in progress at Bass River, Beverly.
- Aug. 29. Weir River, in Hull, relative to alleged dumping of material.
- Aug. 30. Davis Neck at Bay View, Gloucester.
- Sept. 1. Boston harbor frontage from Rowes wharf to Lewis wharf, relative to alleged dumping of material.
- Sept. 2-3. Town boundary survey work at Harwich; jetties and channel at Bass River, South Yarmouth.

1904.

- Sept. 8-10. Protective work on Connecticut River at Hatfield and Hadley; town boundary survey work at Rutland.
- Sept. 13. Frontage on Fort Point channel below Congress Street bridge, relative to structure erected beyond the harbor line.
- Sept. 20-22. Work in progress at Lake Anthony, Cottage City; work done under the direction of the Board at Menamsha Inlet.
- Sept. 27-28. Work in progress at the entrance to Cotuit harbor; jetties at East Bay, Osterville.
- Sept. 30. Bank of Merrimac River along the Haverhill frontage and location of line limiting structures.
- Oct. 3. Work in progress at Lake Anthony, Cottage City; Vineyard Haven harbor; town boundary survey work at West Tisbury.
- Oct. 6. Jetties and channel at Bass River, South Yarmouth.
- Oct. 10. Wharves and terminal facilities in Boston harbor.
- Oct. 13-14. Vineyard Haven harbor, relative to proposed breakwater.
- Oct. 14. Work done by the Commonwealth at Lake Anthony, Cottage City.
- Oct. 15. Protective work on Connecticut River bank at Hadley.
- Oct. 22. East and West bays, Osterville.
- Oct. 24. Site of proposed work at Red River, Chatham.
- Oct. 25. Site of alleged removal of material at Davis Beach, Nahant.

LICENSES GRANTED DURING THE YEAR.

Nos.

- 2809. Petition of the city of Boston for license to dump snow and ice into tide water. Granted Dec. 1, 1903.
- 2810. Petition of Peter T. Fallon and others for license to build a sea wall and fill solid on Town River, in Quincy. Granted Dec. 23, 1903.
- 2811. Petition of the town of Dartmouth for license to widen the causeway across Apponagansett River, in Dartmouth. Granted Jan. 5, 1904.
- 2812. Petition of Emma Alexanderson for license to build a bulkhead and other structures, and to dredge a channel, on Weymouth Fore River, in Weymouth. Granted Jan. 6, 1904.

Nos.

2813. Petition of the Boston & Maine Railroad for license to widen its pile platform on the south channel of Mystic River, at Mystic wharf, in Boston. Granted Jan. 19, 1904.
2814. Petition of the city of Northampton for license to extend a sewer into Connecticut River, in Northampton. Granted Jan. 26, 1904.
2815. Petition of James N. Thompson, trustee, for license to drive piles at his wharf on South Bay, in Boston. Granted Feb. 15, 1904.
2816. Petition of Alice B. Bond for license to build a wharf, partly solid and partly on piles, in Lewis Bay at Hyannis, in the town of Barnstable. Granted Feb. 15, 1904.
2817. Petition of William B. Stearns for license to build bulkheads and marine railway, and to fill solid, in Little harbor, in Marblehead. Granted Feb. 18, 1904.
2818. Petition of the town of Westport for license to reconstruct the bridge across the Acoaksett River at Westport Point, in the town of Westport. Granted Feb. 24, 1904.
2819. Petition of the Rockport Granite Company of Massachusetts for license to maintain a pier and to extend the same in Hodgkins Cove, in Gloucester. Granted Feb. 24, 1904.
2820. Petition of the town of Northfield for approval of plans for building a highway bridge across Connecticut River, under authority of chapter 530 of the Acts of 1901. Granted Feb. 29, 1904.
2821. Petition of Charles Albion Clark and others for license to build a sea wall and fill solid on South River, in Salem. Granted March 1, 1904.
2822. Petition of the Massachusetts Highway Commission for approval of plans for building a State highway in and over tide water between Saugus River and Commercial Street, in Lynn, under authority of Chapter 384 of the Acts of 1903. Granted March 10, 1904.
2823. Petition of the Nantasket Beach Steamboat Company for license to extend its wharf, on piles, in Hingham Bay at Crow Point, in Hingham. Granted March 10, 1904.
2824. Petition of the Wollaston Yacht Club for license to build a pile wharf, drive piles for the support of a club house, and locate and maintain two floats in Quincy Bay, in Quincy. Granted March 14, 1904.

- Nos.
2825. Petition of the County Commissioners of Plymouth County for approval of plans for building a bridge over North River, between Hanover and Pembroke, under authority of chapter 441 of the Acts of 1903. Granted March 16, 1904.
2826. Petition of the Winthrop Yacht Club for license to build a pile structure in Crystal Cove, in Winthrop. Granted March 21, 1904.
2827. Petition of the Edison Electric Illuminating Company of Boston for license to drive piles in its wharf in Boston harbor near the Reserved channel at South Boston, and to dredge. Granted March 22, 1904.
2828. Petition of the Beverly Gas and Electric Company for license to build a bulkhead and pile wharf, and to fill solid, on Bass River, in Beverly. Granted April 5, 1904.
2829. Petition of the Nantasket Beach Steamboat Company for license to drive piles in Plymouth harbor, at Long Wharf, in Plymouth. Granted April 13, 1904.
2830. Petition of H. Frances Dunning, for license to drive piles, build a bulkhead and fill solid on Mystic River, in Somerville. Granted April 18, 1904.
2831. Petition of the National Dock and Warehouse Company for license to build a sea wall and pile platform, and to fill solid a portion of its dock, in Boston harbor, at East Boston. Granted April 21, 1904.
2832. Petition of the city of Salem for license to rebuild the bridge at North Street across North River, in Salem. Granted April 25, 1904.
2833. Petition of Anna R. Pope for license to maintain a drain pipe in Massachusetts Bay, in Cohasset. Granted April 25, 1904.
2834. Petition of Bessie Goldberg for license to drive piles for the support of a building on South River, in Salem. Granted April 25, 1904.
2835. Petition of J. E. Lewis & Co. for license to extend a wharf, on piles, on Chelsea Creek, in Chelsea. Granted April 26, 1904.
2836. Petition of Freeman M. Crosby for license to build a pile wharf on Centreville River, in Barnstable. Granted April 26, 1904.

Nos.

2837. Petition of the Board of Railroad Commissioners, the Board of Harbor and Land Commissioners and the County Commissioners of Bristol County, constituted a joint board by chapter 462 of the Acts of 1903, for approval of plans for building a new drawbridge across Taunton Great River, between Fall River and Somerset. Granted May 2, 1904.
2838. Petition of the city of Boston for approval of plans for the construction and maintenance of a water pipe box and a tunnel for a water pipe across Fort Point channel, near Congress Street bridge, under authority of chapter 273 of the Acts of 1904. Granted May 9, 1904.
2839. Petition of the American Printing Company for license to build a wharf, construct a sea wall and fill solid on Taunton River, in Fall River. Granted May 10, 1904.
2840. Petition of Charles A. King for license to maintain a wharf as now built and to extend the same in Mattapoissett harbor, in Mattapoissett. Granted May 12, 1904.
2841. Petition of William Slaunwhit for license to build and maintain a temporary pier and floats in Hingham Bay, at Hough's Neck, in Quincy. Granted May 12, 1904.
2842. Petition of the Quincy Yacht Club for license to extend and widen its club house, on piles, in Hingham Bay, at Hough's Neck, in Quincy. Granted May 12, 1904.
2843. Petition of Arthur M. Phillips for license to extend a pier, on piles, and locate and maintain a float stage, in Onset Bay, in Wareham. Granted May 12, 1904.
2844. Petition of Florence O. Shepard for license to build and maintain a solid filled wharf and a float in Marion harbor, in Marion. Granted May 17, 1904.
2845. Petition of Daniel H. Flanders for license to build a pile wharf on Menamsha Creek, in Gay Head. Granted May 17, 1904.
2846. Petition of Charles L. Gifford for approval of plans for building a bridge across the mouth of Santuit River in Barnstable, under authority of chapter 213 of the Acts of 1904. Granted May 17, 1904.
- 2846A. Petition of Charles L. Gifford for license to fill solid in Popponesset Bay, in Mashpee and Sandwich. Granted May 17, 1904.

Nos.

2847. Petition of the Windermere Association for license to build and maintain a pile pier and floats in Hull Bay, in Hull. Granted May 20, 1904.
2848. Petition of the Chadwick-Boston Lead Company for license to fill solid on Forrest River, in Salem. Granted May 20, 1904.
2849. Petition of the New Bedford Gas and Edison Light Company for license to build a solid filled wharf on Acushnet River, in New Bedford. Granted May 20, 1904.
2850. Petition of the Old Colony Yacht Club for license to build and maintain pile structures and to locate and maintain floats in Dorchester Bay, at Savin Hill, in the city of Boston. Granted May 24, 1904.
2851. Petition of George B. Wilbur for license to build a marine railway in Woods Hole Great harbor, at Woods Hole, in Falmouth. Granted June 1, 1904.
2852. Petition of the Plymouth Cordage Company for license to extend its wharf, on piles, to drive additional piles and construct four pile dolphins, in Plymouth harbor, in Plymouth. Granted June 7, 1904.
2853. Petition of Cannon & Hasty for license to build a pile and timber landing in Lake Quinsigamond, in Worcester. Granted June 7, 1904.
2854. Petition of the United Shoe Machinery Company for license to build a bulkhead and pile wharf, and to fill solid, on Bass River, in Beverly. Granted June 7, 1904.
2855. Petition of the County Commissioners of Essex County for approval of plans for rebuilding the highway bridge across Bass River, at Bridge Street, in Beverly, under authority of chapter 341 of the Acts of 1903. Granted June 9, 1904.
2856. Petition of the city of Cambridge for license to build a temporary boat landing in Charles River basin, westerly of and near Harvard bridge, in Cambridge. Granted June 9, 1904.
2857. Petition of the Marblehead Associates for license to build and maintain a stone and timber pier and a float in Marblehead harbor, in Marblehead. Granted June 14, 1904.
2858. Petition of the Beverly Gas and Electric Company for license to build a bulkhead and fill solid, on Bass River, in Beverly. Granted June 20, 1904.

Nos.

2859. Petition of J. F. Pope & Son for license to build bulkheads and pile wharves, and to fill solid, on Bass River, in Beverly. Granted June 20, 1904.
2860. Petition of John A. Dedcovich for license to build a sea wall and fill solid, in Gloucester harbor, at Smith's Cove, in Gloucester. Granted June 20, 1904.
2861. Petition of the Turners Falls Lumber Company for license to hang and maintain two booms in Connecticut River, in Gill and Montague. Granted June 20, 1904.
2862. Petition of Bessie Goldberg for license to drive piles for the support of a building on South River, in Salem. Granted June 22, 1904.
2863. Petition of the Metropolitan Park Commission for license to build a sea wall and timber groyne, and fill solid, in Massachusetts Bay, at Red Rock, in Lynn. Granted June 23, 1904.
2864. Petition of the Metropolitan Water and Sewerage Board for approval of plans for driving piles in the wharf at Deer Island, in Boston harbor, and building a pile structure in connection with said wharf, under authority of chapter 439 of the Acts of 1889. Granted July 5, 1904.
2865. Petition of the town of Manchester for license to locate and maintain a float for landing purposes in Manchester harbor, in Manchester. Granted July 5, 1904.
2866. Petition of the Edison Electric Illuminating Company of Boston for approval of plans for laying two submarine cables across the draw ways in Charlestown bridge, in Boston, under authority of chapter 249 of the Acts of 1898. Granted July 7, 1904.
2867. Petition of the Sylvester Company for license to build a pile wharf, bulkhead and crib work, and to fill solid, on Waters River, in Danvers. Granted July 8, 1904.
2868. Petition of the Lynn Gas and Electric Company for license to build a sea wall and bulkhead, and fill solid, in Lynn harbor, in Lynn. Granted July 8, 1904.
2869. Petition of the city of Boston for approval of plans for building a highway bridge across Fort Point channel, in Boston, being a part of Northern Avenue as laid out by chapter 381 of the Acts of 1903. Granted July 18, 1904.
2870. Petition of Sarah E. Newhall and others for license to build a bulkhead and pile platform, and to fill solid, in Lynn harbor, in Lynn. Granted July 18, 1904.

- Nos.
2871. Petition of the Boston & Albany Railroad, the New York Central & Hudson River Railroad Company, lessee, for license to reconstruct its pier No. 3, in Boston harbor, at East Boston. Granted July 27, 1904.
2872. Petition of the Old Colony Street Railway Company for license to build a pile dolphin and pile structure leading thereto, in Weymouth Fore River, at Quincy Point, in Quincy. Granted July 27, 1904.
2873. Petition of the Metropolitan Water and Sewerage Board for approval of plans for placing riprap at the siphon structure across Malden River, in Everett and Medford, under authority of chapter 439 of the Acts of 1889. Granted July 27, 1904.
2874. Petition of the Plymouth Cordage Company for license to build a sea wall and fill solid, in Plymouth harbor, in Plymouth. Granted July 28, 1904.
2875. Petition of Levi L. H. Taylor for license to build a solid filled wharf on Merrimac River, in Haverhill. Granted July 29, 1904.
2876. Petition of the Beachcomber Club for license to locate and maintain a float in Marblehead harbor, in Marblehead. Granted Aug. 2, 1904.
2877. Petition of the Tudor Company for license to rebuild a portion of Tudor wharf on piles, on Charles River, in Boston. Granted Sept. 22, 1904.
2878. Petition of Marian C. Upton for license to build and maintain a pier and float in Marblehead harbor, in Marblehead. Granted Sept. 26, 1904.
2879. Petition of the United States for license to dredge and lay a water pipe in Boston harbor, from Nut Island to Peddocks Island. Granted Oct. 5, 1904.
2880. Petition of the Metropolitan Steamship Company for license to build a sea wall and pile platform, and to dredge, in Boston harbor, at Union wharf, in Boston. Granted Oct. 5, 1904.
2881. Petition of William M. Butler for license to build an addition to his wharf in Edgartown harbor, in Edgartown. Granted Oct. 5, 1904.
2882. Petition of the Horse Neck Beach Street Railway Company for license to widen its wharf in Westport harbor, at Westport Point, in the town of Westport. Granted Oct. 6, 1904.

Nos.

2883. Petition of the Boston & Maine Railroad for approval of plans for rebuilding the bridge known as the Boston & Lowell freight bridge, on piles, across Charles River in Boston and Cambridge, under authority of chapter 465 of the Acts of 1903. Granted Oct. 7, 1904.
2884. Petition of Allen P. Eagleston and Edward L. Eagleston for license to build a pile pier in Vineyard Haven harbor, in Tisbury. Granted Oct. 11, 1904.
2885. Petition of Albert E. Angier for license to build and maintain a solid filled wharf and a float in Marion harbor, in Marion. Granted Oct. 11, 1904.
2886. Petition of the Boston & Maine Railroad for license to rebuild its pile platform on Mystic River, at Mystic wharf, in Boston. Granted Oct. 11, 1904.
2887. Petition of the County Commissioners of Hampden County for approval of plans for building a bridge over Connecticut River, between Chicopee and West Springfield, under authority of chapter 398 of the Acts of 1904. Granted Oct. 11, 1904.
2888. Petition of the Murray & Tregurtha Company for license to build a bulkhead and launching ways, and to fill solid, in Boston harbor, near the Reserved channel, at South Boston. Granted Oct. 21, 1904.
2889. Petition of the Cambridge Bridge Commission for approval of plans for building a highway bridge across Charles River between Boston and Cambridge, to be known as Brookline Street bridge, under authority of chapter 391 of the Acts of 1904. Granted Oct. 21, 1904.
2890. Petition of Cunningham and Thompson for license to extend their wharf, on piles, in Gloucester harbor, in Gloucester. Granted Oct. 21, 1904.
2891. Petition of the Boston & Albany Railroad, the New York Central and Hudson River Railroad Company, lessee, for license to rebuild its bridge, on piles, on its Grand Junction branch, across Charles River, in Boston and Cambridge. Granted Oct. 27, 1904.
2892. Petition of Nellie B. Cumner for license to lay and maintain a drain pipe in Massachusetts Bay, in Cohasset. Granted Oct. 28, 1904.
2893. Petition of Mary A. Dubois for license to build a solid filled pier in Mount Hope Bay, in Fall River. Granted Oct. 28, 1904.

- Nos.
2894. Petition of the Malden and Melrose Gas Light Company to lay and maintain a 24-inch cast iron gas pipe under Malden River, in Malden. Granted Nov. 1, 1904.
2895. Petition of Arthur W. Peterson for license to build and maintain an ice run in Vaughan's Pond in Carver. Granted Nov. 8, 1904.
2896. Petition of the city of Haverhill for license to construct a sewer outlet in Merrimac River, in Haverhill. Granted Nov. 14, 1904.
2897. Petition of Florence W. Fish and Josephine W. Fish for license to build and maintain a pile wharf in Little harbor, at Woods Hole, in the town of Falmouth. Granted Nov. 14, 1904.
2898. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Nov. 15, 1904.
2899. Petition of the Boston Elevated Railway Company for license to dump snow and ice into tide waters. Granted Nov. 17, 1904.
2900. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River, in Boston. Granted Nov. 17, 1904.
2901. Petition of the city of Gloucester for license to build and maintain a pipe way for water and gas mains, also conduits for electric wires, across the canal near Cut bridge, in Gloucester. Granted Nov. 18, 1904.
2902. Petition of the Beverly Gas and Electric Company for license to construct a pipe way for a gas main and conduits for electric wires across Bass River, at Bridge Street, in Beverly. Granted Nov. 18, 1904.
2903. Petition of the city of Boston for license to extend its wharf, on piles, in Boston harbor, on the northwesterly side of Long Island. Granted Nov. 18, 1904.
2904. Petition of the Old Colony Railroad, the New York, New Haven & Hartford Railroad Company, lessee, for license to extend the abutments and fill solid back of the same at its bridge across Jones River, in Kingston. Granted Nov. 22, 1904.
2905. Petition of Joshua Crane for license to build and maintain a pile wharf, marine railway and float stage in Pocasset harbor, at Cataumet, in the town of Bourne. Granted Nov. 22, 1904.
2906. Petition of Bessie Goldberg for license to build a pile structure on South River, in Salem. Granted Nov. 22, 1904.

PETITIONS DENIED AND WITHDRAWN.

On April 7, 1904, the Old Colony Street Railway Company, petitioner for a deed of tide water land of the Commonwealth in Mount Hope Bay, Fall River, covered by license No. 2773, was given leave to withdraw, it appearing from an opinion of the Attorney-General, to whom the matter was referred, that this Board is not authorized to convey to said company the land in question.

On April 28, 1904, the Okahawis Canoe Club, petitioner for license to build and maintain a pier and float in Salem harbor, was given leave to withdraw, at its request.

On May 16, 1904, the Boston Yacht Club, petitioner for license to locate and maintain floats in Marblehead harbor adjoining its wharf, was given leave to withdraw, as it appeared that the proposed location of these floats would be an interference with general navigation in that portion of the harbor.

On May 18, 1904, the petition of the superintendent of streets of Boston for license to build structures in Charles River basin was dismissed, the Board being of opinion that the passage of the Charles River dam act, St. 1903, chapter 465, rendered it unnecessary to issue a license for the proposed work.

On May 25, 1904, the petition of Cannon & Haste for license to build and maintain a boat landing in Lake Quinsigamond, in Worcester, was dismissed, it appearing that the petitioners were not owners of the land in front of which the structure was to be built.

On June 8, 1904, the trustees of the New England Real Estate Trust, petitioners for license to build a bulkhead and fill solid in Boston harbor at South Boston, were given leave to withdraw the petition, at their request.

On Sept. 6, 1904, parties who had previously requested the Board to recall license No. 2867, authorizing the building of a structure on Waters River, in Danvers, and to reopen the hearing, were notified of the adverse decision of the Board, based upon an opinion of the Attorney-General, stating that this commission lacked authority to revoke or recall the license in question.

On Sept. 14, 1904, George N. Talbot and others, petitioners for modification of a structure built in Phinney Bay in the town of Barnstable, under license from the Board, were given leave to withdraw the petition, at their request.

On Nov. 28, 1904, the East Boston Company, petitioner for license to rebuild and extend a wharf in Boston harbor at East Boston, was given leave to withdraw the petition, at its request.

MISCELLANEOUS PERMITS GRANTED DURING THE YEAR.

ISAAC BLAIR & Co., to dump snow from Dover Street bridge into tide water, in Boston. Granted Jan. 13, 1904.

UNION FREIGHT RAILROAD COMPANY, to dump snow from Craigie bridge into Charles River, in Boston. Granted Feb. 4, 1904.

FRED E. ELLIS, to dredge material from Lynn harbor. Granted Feb. 12, 1904.

PROCTOR & DRUMMEY, to dump snow from Dover Street bridge into tide water, in Boston. Granted Feb. 18, 1904.

CHARLES DUNCAN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Feb. 29, 1904.

FRANK J. HANNON, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Feb. 29, 1904.

JOSEPH L. BOARDMAN, to remove gravel from Salter's beach, in Plymouth. Granted March 10, 1904.

JEREMIAH P. O'RIORDEN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted March 15, 1904.

HARRY E. CONVERSE, to dump material dredged near his wharf in Marion harbor on an area located southerly of Charles Neck Point and lying between said point and the buoy on "The Bow Bells." Granted March 29, 1904.

JAMES F. DOOLEY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted March 29, 1904.

TRUSTEES OF THE MAIN STREET LAND TRUST, to dredge material from their flats in Charles River, on the Cambridge side of the channel, near Cambridge bridge. Granted March 31, 1904.

WOLLASTON YACHT CLUB, to remove portion of shoal at the outer end of its wharf, in Quincy Bay. Granted April 5, 1904.

OLD COLONY STREET RAILWAY COMPANY, to dredge in Weymouth Fore River, near Quincy Point, in Quincy. Granted April 6, 1904.

HARRIES & LETTENY CO., to dump material dredged from near Wollaston beach on the shore between Moon Island and Squantum and along the easterly shore of Squantum. Granted April 8, 1904.

BAY STATE DREDGING COMPANY, to dump material dredged from Dorchester Bay near Savin Hill and Commercial Point, on flats of the Bay State Gas Company at the outer end of the Calf Pasture. Granted April 8, 1904.

NANTASKET BEACH STEAMBOAT COMPANY, to remove accumulations of material from the basin around Long wharf, in Plymouth harbor. Granted April 13, 1904.

NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY OF MASSACHUSETTS, to set and maintain one pole in Anchor Street, on the Commonwealth flats at South Boston. Granted May 5, 1904.

SQUANTUM YACHT CLUB, to dredge a basin off the outer end of its wharf, in Quincy Bay. Granted May 5, 1904.

BOSTON HARBOR STEAMBOAT COMPANY, to remove accumulations of material in the channel leading from Weir River to its wharf in Hull. Granted May 23, 1904.

TOWN OF HULL, to take material from the beach easterly of Beach Avenue and near its junction with B Street, for the purpose of building a portion of said avenue. Granted May 24, 1904.

CITY OF BEVERLY, to lower the water pipe laid across Bass River at Bass River bridge, in Beverly. Granted June 27, 1904.

MILTON DA COSTA, to use and occupy Quarantine Rock, in Boston harbor. Granted July 8, 1904.

JAMES FIELDEN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted July 18, 1904.

NANTASKET BEACH STEAMBOAT COMPANY, to remove accumulations of sand in the berths and around Pemberton pier, in Hull. Granted July 22, 1904.

BOSTON & MAINE RAILROAD, to build a temporary structure over Charles River, connecting the draw piers of the bridges on its Fitchburg division. Granted July 28, 1904.

WILLIAM BARRETT, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted July 29, 1904.

BOSTON & MAINE RAILROAD, to publish notice, in the name of the Board, of the closing of Millers River to the passage of vessels through the draw in its Western division bridge, for the purpose of making repairs to said bridge. Granted Aug. 12, 1904.

THOMAS BUTLER & Co., to use a berth in the channel or depression easterly of the Commonwealth pier, at South Boston, for the purpose of mooring the ship "Hotspur." Granted Aug. 24, 1904.

JOHN T. SCULLY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Sept. 19, 1904.

CITY OF BOSTON, to dump on the Commonwealth flats at South Boston material excavated from A Street, South Boston. Granted Oct. 12, 1904.

JAMES F. NYHAN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Oct. 12, 1904.

COLEMAN BROTHERS, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Oct. 13, 1904.

PATRICK HUGHES, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Oct. 21, 1904.

THOMAS WHITE, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Oct. 21, 1904.

JAMES P. MCSORLEY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Oct. 25, 1904.

HUTCHINSON LUMBER COMPANY, to dredge a channel and dock on its land and flats in Lynn harbor. Granted Oct. 28, 1904.

METROPOLITAN PARK COMMISSIONERS, to excavate material from Mystic River, in Medford and Somerville. Granted Nov. 1, 1904.

WORK OF THE UNITED STATES IN RIVERS AND HARBORS OF THE COMMONWEALTH.

The Board is indebted to Col. W. S. Stanton, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and Lieut.-Col. J. H. Willard, Corps of Engineers, U. S. A., who is in charge

of similar work in southern Massachusetts, for the following statements, which show the work accomplished in the rivers and harbors of this Commonwealth during the fiscal year ending June 30, 1904:—

STATEMENT OF COL. W. S. STANTON, CORPS OF ENGINEERS, U. S. A.

BOSTON, MASS., Dec. 9, 1904.

*Harbor and Land Commissioners, Commonwealth of Massachusetts,
State House, Boston, Mass.*

SIRS:—In accordance with your request of Nov. 17, 1904, I have the honor to furnish the following summary of work done by the United States during the fiscal year that closed June 30, 1904, in the rivers and harbors in Massachusetts under my charge.

Merrimac River.

Under a contract for dredging the channel 7 feet deep at mean low water and 150 feet wide through all shoals below Haverhill, 12,567 cubic yards of mud, sand, gravel, clay and bowlders were dredged from the section above Rocks bridge, and 4,862 cubic yards from the section below that bridge, obtaining a channel 150 feet wide up to the highway bridge at Haverhill, except at a shoal about 3,000 feet above Rocks bridge, where, for about 800 feet, the channel width is reduced to 100 feet.

A survey of the river was made during the year, of which a report, together with estimate, for deepening the channel to 9 feet at mean low water, was submitted in November, 1903, and published in House Document No. 311, 58th Congress, second session.

Newburyport Harbor.

On June 21, 1904, bids were opened, and contract was authorized for repairing both the north and south jetties, and for extending the south jetty as far as the available funds would permit. No work under this contract had been performed at the close of the fiscal year.

Breakwater for Harbor of Refuge, Sandy Bay, Cape Ann.

Under the contract for continuing the construction of this breakwater, 112,411.5 tons of rubble stone were placed in the western and 3,929 tons in the southern arm of the breakwater, completing the substructure of the western arm for a length of 605 feet to a height of 12 feet below mean low water, and a core of the superstructure for the same length up to mean low water, with a width

of 30 feet on top. The stone deposited in the southern arm was placed on the seaward face to fill it out to the prescribed slope.

At the close of the fiscal year work was in progress, and 3,530 linear feet of the substructure of the southern arm and 1,430 feet of the substructure of the western arm had been practically completed.

Rockport Harbor.

Under the contract for rebuilding the breakwaters, 9,721.5 tons of rubble stone were deposited during the year, and the rebuilding of the breakwaters was completed, making the Bearskin Neck breakwater 900 feet long and Norwoods Head breakwater 200 feet long.

Gloucester Harbor.

Under the contract for completing the breakwater on or before Sept. 30, 1906, 16,236.5 tons of dimension stone and 4,082 tons of rubble stone were placed in 845 linear feet of the superstructure; 39,496 tons of rubble stone were placed in the substructure and 850 tons of riprap stone were placed in the apron along the base of the superstructure on the seaward side.

At the close of the year the substructure was entirely completed for 2,250 feet and the superstructure for 1,122 feet from shore. Work was in progress on the superstructure.

Manchester Harbor.

Under contract for dredging from the channel of this harbor, 10,499.6 cubic yards of mud and sand were dredged, continuing the channel 100 feet wide at the turns and 75 feet wide elsewhere to the depth of 6 feet at mean low water, 1,100 feet up stream to a point 220 feet below the south-west corner of Read's wharf.

Beverly Harbor.

Under the contract for dredging in this harbor, 18,206.6 cubic yards of mud, sand and gravel were dredged between Tucks Point and Salem Neck, widening to 200 feet the entrance channel 18 feet deep at mean low water, excepting over obstructing ledges, on which the least depth is 12 feet, and which reduce the available width at two points to 150 feet.

Lynn Harbor.

Under a contract for dredging from the channel of this harbor, 49,449 cubic yards of material were dredged from the outer main

ship channel, deepening it to 15 feet for a width of 100 feet on straight and 125 feet on curved sections, extending from the deep basin opposite Little Nahant, a distance of 4,600 feet, to the sea.

Malden River.

Five thousand six hundred fifty-four cubic yards of material were dredged from the channel of this river in restoring the prescribed depth of the channel at two localities where shoals obstructed the ascent of barges with coal to Malden.

Boston Harbor.

To secure a channel 27 feet deep at mean low water and 1,000 feet wide, in the lower main ship channel, under a contract for the excavation of 19,008 cubic yards of ledge, in the removal of 21 ledges, drilling and blasting were continued during the year; 11,503 cubic yards, scow measurement, of blasted material were removed. The removal of one ledge was completed.

Under a contract to remove 223 cubic yards, in 3 ledges, from the lower main ship channel, and 2,066 cubic yards, in 11 ledges, in the upper main ship channel, the breaking up of the rock (without drilling or blasting) has extended over 2 ledges in the lower main ship channel and over 4 ledges in the upper main ship channel, and 490 cubic yards, scow measurement, of broken rock have been removed. None of the 14 ledges has been removed to the depth of 27 feet.

In maintenance of the 27-foot channel, 23,147 cubic yards of gravel, cobblestones, clay and mud were dredged by hired plant from the lower main ship channel in removal of numerous shoals from President Roads to Boston Light.

In Broad Sound, under a contract for dredging a channel 30 feet at mean low water and 1,200 feet wide, 61,359.4 cubic yards of stone, gravel and clay, and 66,048 cubic yards of bowlders over 6 tons in weight each, were dredged, completing, on May 6, 1904, the original contract for dredging this channel.

To avoid the costly removal of 5 ledges uncovered by the dredging in the easterly side of the outer arm of this channel, a supplemental contract was entered into for dredging 75,292 cubic yards of material from the westerly side of that arm in a strip 55 feet wide. Dredging under this supplemental contract had not been commenced at the close of the fiscal year.

Under the project authorized by act of Congress, approved June 13, 1902, to obtain a channel 35 feet deep at mean low

water, 1,200 feet in width in the upper main ship channel from Boston to President Roads, and 1,500 feet in width from President Roads to the sea at Broad Sound, four contracts were in force at the beginning of the fiscal year, embracing the removal in the aggregate of 9,780,000 cubic yards of material, of which 7,500,000 cubic yards will be dredged from the upper main ship channel and 2,280,000 cubic yards from President Roads to Broad Sound. During the fiscal year under these contracts 1,129,405.5 cubic yards were dredged from the upper main ship channel and 73,943.5 cubic yards from the channel extending from President Roads to the sea.

In maintenance of sea walls protecting the islands and headlands of the harbor, the rebuilding of the south head sea wall on Deer Island was completed; walls on Long Island and Lovell's Island were repointed, and minor repairs were made to these two latter walls and to the wall on Great Brewster Island.

Cohasset Harbor.

Ten thousand two hundred ninety-nine cubic yards of mud, sand, gravel and clay and 105 cubic yards of rock were removed from this harbor during the fiscal year under contracts, the completion of which obtained a channel 4 feet deep at mean low water, 60 to 75 feet wide, extending from the entrance to the inner harbor, to and along the wharf front, to a point about 100 feet west of Tower's wharf.

Plymouth Harbor.

During the fiscal year, Eel River was returned to its former course, discharging into the harbor. In this operation 2,085 cubic yards of earth were excavated from its original bed and a dam of earth and sand bags was built across its new bed.

To prevent it from being again turned into the sea, 536 linear feet of stone dike were built in front of it, in the vicinity of its closed passage to the sea.

Provincetown Harbor.

Six groynes of pile and timber, 300 feet apart, aggregating 995 feet in length, were built on the beach near Abel Hill dike.

Very respectfully,

W. S. STANTON,
Colonel, Corps of Engineers.

Statement of Lieut.-Col. J. H. Willard, Corps of Engineers, U. S. A., showing the work done by the United

States on the rivers and harbors of Massachusetts under the Newport, R. I., engineer office, during the fiscal year ending June 30, 1904: —

Hyannis Harbor.

The contract for dredging this harbor, entered into Dec. 8, 1902, was annulled Sept. 5, 1903, and a new contract entered into under date of November 25. Dredging under this contract was commenced May 27, 1904, and up to the close of the fiscal year 25,346 cubic yards were excavated, adding 3.6 acres to the 15.5-foot anchorage area protected by the breakwater. This completed about one-third of the contract.

Nantucket Harbor.

After an examination of the effect of the breach in the Haulover Beach on the jetty channel, the contract of Jan. 19, 1903, for jetty construction, was modified by supplemental articles of agreement, and the amount of the contract was increased to \$10,000, the stone to be deposited along the centre line of the jetty and allowed to stand at as steep a slope as it would assume, across the gap near the shore end of the jetty. Work under this contract was commenced May 31, 1904, and up to the end of the fiscal year 2,653 tons of stone were so placed, completing about two-thirds of the contract.

Vineyard Haven.

No works of improvement have been in progress during the fiscal year. Further work at this harbor is dependent upon the result of the examination of the Board of Engineers, convened in accordance with the river and harbor act of June 13, 1902, to consider the general subject of harbors in this locality.

Woods Hole.

Work under the contract for dredging and removing bowlders from the strait was completed July 8, 1903. The total amount removed was 5,389 cubic yards of clay, gravel and small bowlders and 50.3 cubic yards of bowlders exceeding one cubic yard each.

The main channel has been cleared of all obstructing shoals to a depth of 13 feet at mean low tide for its full width of 300 feet, excepting two small shoals on its northern edge near Devil's Foot Island, and the main shoal at its eastern end, through which the 13-foot channel has a width of 225 feet.

New Bedford Harbor.

The work of dredging, in the anchorage area in this harbor, under the contract in force at the close of the last fiscal year, was resumed July 14, 1903, and completed December 12. A total of 178,372 cubic yards of mud and sand were removed, completing the contract and all approved projects for this harbor.

Taunton River.

No work of improvement has been in operation during the past fiscal year beyond a few days' work at the beginning of the year in completing the contract for dredging near Dighton wharf and Wickamount, which was completed July 3, 1903.

Fall River Harbor.

Work was continued through the greater part of the year under the continuing contract for dredging a channel 25 feet deep at mean low water and 300 feet wide through Fall River harbor and across Mount Hope Bay. Up to the close of the fiscal year, 948,233 cubic yards of mud and sand had been removed, completing about 87 per cent. of the contract. The unusually severe winter compelled a discontinuance of the work during January, February and the greater part of March.

Removal of Wrecks.

The following wrecks were removed so as no longer to form obstructions to navigation: Schooner "Sarah Potter," off the Handkerchief Shoal; schooner "Dora Mathews," $3\frac{1}{2}$ miles north-east of Sankaty Head, Nantucket; schooner "Agnes E. Manson," $6\frac{1}{2}$ miles east $\frac{1}{2}$ mile north from Sankaty Head; schooner "Marriott," 10 miles west south-west from Vineyard Sound lightship; barge "Fidelia," from 3 miles west of Hen and Chickens lightship; schooner "Albert F. Stearns," from Rogers shoal, near Monomoy Point; schooner "Levi Hart" and an unknown wreck, from Pollock Rip slough.

Preliminary Examinations and Surveys.

Preliminary examinations with a view to improvements were made at the following localities: Little Harbor, Woods Hole; Onset harbor; Weepecket rock, in Buzzards Bay; also by a board of engineers constituted by the river and harbor act of June 13, 1902, to make an examination of Vineyard and Nantucket sounds

and the east shore of Cape Cod, with a view to reporting upon the relative merits of said localities for harbors of refuge.

Onset harbor was deemed unworthy of improvement by the general government, and surveys were ordered at Little Harbor, Woods Hole, and Weepecket rock.

The report of the board of engineers considering the subject of harbors of refuge was printed in House Document No. 60, fifty-eighth Congress, second session.

PROPOSED BRIDGE OVER TAUNTON GREAT RIVER, BETWEEN
THE CITY OF FALL RIVER AND TOWN OF SOMERSET.

A Joint Board, consisting of the Railroad Commissioners, the Harbor and Land Commissioners and the County Commissioners of the county of Bristol, was constituted by chapter 462 of the Acts of 1903, and directed to locate and construct a new drawbridge over Taunton Great River, between the city of Fall River and the town of Somerset, with the necessary approaches and ways thereto, at a cost not to exceed \$1,000,000.

The Joint Board, after a study of the project and public hearings, with the aid of expert engineers, determined that it is inexpedient to build a bridge adapted for the purposes of railroad, street railway and ordinary public travel; and that a separate bridge for public travel, sufficiently strong to carry a street railway if hereafter needed, would best meet the requirements of the community.

The question of site became of prime importance, and no less than four different locations were advocated by different interests. The Board finally fixed on one about 1,200 feet north of the existing Slade's Ferry bridge, with the easterly terminus at Brightman Street and the westerly terminus at the old ferry slip, where the river is about 1,000 feet wide, as combining the greatest convenience to the greatest number of the public travelling by land, while creating the least possible obstruction to navigation, and at the same time avoiding any curtailment of the harbor. At the point selected the distance between the abutments would be less than at any other site considered, thereby materially reducing the cost. A greater elevation also could be maintained above the level of the water, with easy grades in approach-

ing and less cost of construction. After selecting the site and adopting the plans, the Joint Board, under the requirements of the statute, submitted these plans to the Board of Harbor and Land Commissioners for its approval. Notices were issued and a hearing was given on the plans presented, relative to the location of the draw span, the width of its opening, the height of the bridge above the water level, and the location of the piers with reference to the flow of the tides and the accommodation of passing vessels. With some slight variations from the plans presented, those finally approved provided for a deck bridge 60 feet wide, including sidewalks, and about 960 feet long between abutments, with a lift draw having a clear passageway of 70 feet, located over the mean of mid-currents, yet not without due regard to the flow of the river through the present bridge and the position of the draw therein. The clear height at the centre line of the draw span is to be 28 feet above mean high water, and at no place is there to be less than 14 feet between mean high water and the bottom of the trusses of the fixed spans. The bridge is to be supported by five piers between the abutments. The height of the draw span is fixed to allow the passage under the bridge, without opening the draw, of a large majority of the sail boats and mastless barges frequenting the river. The distance between the bridges is ample to admit of manœuvring or anchoring vessels or tows of reasonable length, which after passing one bridge may be delayed to await the opening of the draw in the next.

In May, 1904, the plans were approved and a license issued by this Board, which was thereafter forwarded by the Joint Board to the War Department for approval. In October, 1904, a public hearing was given by Lieut. Col. J. H. Willard, U. S. A., engineer in charge of the district in which the bridge is to be located, on the question of whether the proposed bridge would unreasonably interfere with the navigation of the river. The chairman of the Joint Board and the chairman of this Board, among others, were heard in support of the license.

The decision of the War Department has not as yet been rendered.

DRY DOCK.

At the last session of the Legislature a resolution was passed relating to this subject, being chapter 103 of the Resolves of 1904, and reading as follows:—

Resolved, That the board of harbor and land commissioners is hereby instructed to investigate the advisability of constructing at the expense of the Commonwealth a dry dock in Boston harbor, and to report thereon to the next general court not later than the fifteenth day of January in the year nineteen hundred and five, including in the report, if the board deems it expedient, suggestions as to the nature of the dock that should be erected, its location, and an estimate of its probable cost, and any other matters which the board may deem desirable.

The advisability of constructing at the expense of the Commonwealth a dry dock in Boston harbor involves many considerations, of which the primary question is the financial one, and that becomes no less important when considering the public demand, most vigorously expressed at the present time, in favor of economy. There are, however, other considerations of great force, and which are entitled to be weighed most seriously, as relating to the proper equipment and further success of the great port of New England, to which the Federal government is generously contributing for the purpose of making it second to none in offering facilities for a great commerce.

In pursuing its investigations the Board has collected and tabulated the existing facilities for docking at the port, has extended its inquiries wherever in this country and abroad data of value were to be obtained, and has given a public hearing in order to get a full expression of the views of the merchants of Boston and all local interests.

In October, 1902, the retiring president of the Boston Associated Board of Trade in an address said: "We can see but one thing lacking necessary to give the great vessels of to-day and the near future all the accommodation of a first-class port, and that is a dry dock of the most approved and modern type, and not less than 800 feet in length. Private capital cannot be invested for such a purpose, for it may

not pay for many years; but the State should also provide this important instrument of commerce. It is not a fad, it is not a luxury, but an actual necessity; and we shall have no right to call our port a first-class one until it is done."

On Feb. 1, 1904, there was presented to the Legislature a petition in behalf of the merchants of Boston for legislation to provide for the construction by the Commonwealth of a dry dock on the Commonwealth flats at South Boston. In support of this petition, at the hearing before the committee on harbors and public lands, the Boston Chamber of Commerce, the Merchants' Association and other mercantile bodies were represented. They stated that the existing Simpson dry docks at East Boston were ample for the size of vessels for which they were built, but that they were not large enough to accommodate the larger vessels now frequenting the port; that foreign steamship managers had called attention most emphatically to the need of a large dry dock in Boston harbor, for use in case of accident happening to one or more of the larger vessels. These views were repeated at the hearing before the Harbor and Land Commissioners, on Dec. 8, 1904.

From the records of the Boston Chamber of Commerce we learn that in 1903 there entered Boston harbor 37 vessels, and in 1904 22 vessels, too large to be docked in the Simpson dock. These were all foreign-owned steamships, most of which were sailing to and from their home ports, and would dock in Boston only in case of serious accident, docking for periodical cleaning and painting ordinarily being done at the home port. A few, probably not more than 8 or 10, of these vessels sailing from other than their home ports might, however, dock in Boston, providing the rates were not more than those at the Mediterranean ports from which they were sailing.

In order to learn to what extent other ports are provided with dry docks, tables have been prepared, from information obtained in Lloyds Register and the Register of United States vessels, the first showing the number of dry docks and marine railways or slips of various sizes throughout the world, — this list includes naval docks as well as commercial docks; the second showing the number of commercial dry

docks and marine railways or slips in the principal ports of the world. The following table shows the present facilities for docking vessels at Boston:—

DRY DOCKS AND MARINE RAILWAYS IN BOSTON HARBOR.

[All dimensions in feet.]

NAME OF DOCK.	Material of Construction.	Length on Top from Outer Groove or Abutment to Head.	Length on Bottom from Outer Groove or Abutment to Head.	Width on Top in Body.	Width on Floor in Body.	Width of Entrance at Coping.	Width of Entrance at Bottom.	Depth of Gate Sill below Coping.	Depth of Sill below Ordinary High Tide.	Ordinary Rise and Fall of Tides.
Navy Yard, old dock, .	Stone,	389	364	80	30	60	44	30	25	9.6
Navy Yard, new dock, {	Stone and concrete, {	750	729	114	72	101.5	75	35	30	9.6
Simpson's dock No. 1, .	Wood,	477	455	81	49	66	41	24	18	9.6
Simpson's dock No. 2, .	Wood,	255	250	68	34	45	30	22	18	9.6
Simpson's dock No. 3, .	Wood,	165	155	44	28	33	22	18	13	9.6

During the neap and spring tides the depth of water over the sills of the various dock will vary from 1 to 2 feet more or less from the depths given in the table.

In case of necessity, 18 feet additional length on floor can be utilized in Simpson's Dock No. 1.

The Navy Yard new dock is nearly completed.

Plans and estimates have been prepared at Washington for a third graving dock at the Navy Yard, about 650 feet long.

It is proposed to reconstruct Green's wooden dry dock, which will take vessels of 165 feet length and 12 feet draft.

MARINE RAILWAYS AT EAST BOSTON.

Atlantic Works marine railways:—

No. 1 has cradle 244 feet long, 70 feet wide; can take vessels drawing $11\frac{1}{2}$ feet forward, $14\frac{1}{2}$ feet aft, and not exceeding 1,800 tons net weight.

No. 2 has cradle 200 feet long, 58 feet wide; can take vessels drawing $12\frac{1}{2}$ feet forward, $15\frac{1}{2}$ feet aft, and not exceeding 800 tons net weight.

No. 3 has cradle 135 feet long, 43 feet wide; can take vessels drawing 14 feet, and not exceeding 500 tons in weight.

Lockwood's marine railway has cradle 150 feet long; can take vessel drawing 8 feet forward and 13 feet aft, and not exceeding 600 tons register.

The Simpson patent dry dock No. 1, which will accommodate vessels up to 450 feet in length, 60 feet in width and

18 feet draft, is the only dock in Boston outside the Navy Yard which could take vessels of any considerable size. The recent records of this dock are as follows : —

	Number of Times Vessels placed in Dock.	Number of Days Dock in Use.
1902,	61	153
1903,	71	147
1904,	68	141

showing that the dock has been in use but little more than half the time. No commercial vessels are placed in the Navy Yard dock except when the Simpson dock is occupied, as that dock for the last fourteen years has been longer than the one at the Navy Yard.

From the records of the Simpson docks it would appear that the No. 1 dock, 455 feet long on bottom, can accommodate all the vessels which are too large to enter either the No. 2 or No. 3 docks; in fact, it has been used to dock many of the smaller vessels which could not be seasonably accommodated in the smaller docks.

Four times during the past seven years vessels could not wait until the Simpson dock was available, and so were docked at the Navy Yard. It is a fair inference, from the records of the last three years, that no material increase in the demand is likely.

Inquiries fail to develop instances of the larger class of steamships seeking a port elsewhere than at home for substantial repairs, because of insufficient dry docks at Boston; at the same time, it might be unwise to rely on the continuance of such exemption.

A complete list of steamships docked for repairs at Simpson's, for the past three years, is as follows : —

1902.

Jan. Steamship "Isle of Kent," 3,038 tons. Had been in collision with a Spanish steamship, which was sunk. Extensive repairs to stem, new frame, and plates. Paid for 19½ days' dockage.

1902.

- April. Steamship "Wilster," 2,101 tons. Had been ashore. Remained in dock a long time for surveys, and finally patched, and went to New York for repairs. Went in a second time, surveyor not being satisfied with the patching. Paid for 18 days' dockage.
- Steamship "Timandra," 1,500 tons. Ran on rocks, outward bound. Paid for 8 days' dockage.
- May. Steamship "Prince George," 2,140 tons. General work. Paid for 4 days' dockage.
- June. Steamship "Indian," of Philadelphia line, 2,110 tons. Had been ashore in Vineyard Sound. Being bound to Boston, she was brought here, discharged and docked. New York bid being less than Boston, she was patched, and taken to Erie Basin, New York, for repairs. Paid for 11 days' dockage.
- Oct. and Nov. Steamship "Aldany," 3,090 tons. Had been ashore. Put on 57 new plates, and treated 58 others. Paid for 30 days' dockage.

1903.

- Jan. Steamship "Priestfield," 3,980 tons. Had been ashore. Put on 12 plates, and again had been in the ice, put on 15 plates. Paid for 6 days' dockage.
- April. Steamship "Peter Jebson," 3,535 tons, collier. Had been ashore on Nix's Mate, outward bound, light. Had new plates, and old ones taken out and straightened. Paid for 14 days' dockage.
- July. Steamship "Grayfield," 2,121 tons. Could not ascertain cause. Paid for $4\frac{1}{2}$ days' dockage.
- Sept. Steamship "Admiral Sampson," 2,104 tons. Had new shaft. Had to wait for it, and docked a second time. Paid for 9 days' dockage in all.

1904.

- June and July. Steamship "Boston," 1,692 tons, Dominion line. Was ashore twice on the Nova Scotia coast. Paid for 4 days' dockage in June and for 14 days in July.

The following tables show the facilities elsewhere : —

[illegible]

TABLE SHOWING NUMBER OF DRY DOCKS OF THE WORLD, ARRANGED ACCORDING TO SIZE — *Concluded.*

PLACE.	GRAVING DOCKS.					FLOATING DOCKS.					SLIPS, ETC.	
	LENGTH ON BOTTOM (FEET).					LIFTING CAPACITY (TONS).					LENGTH OF CRADLE (FEET).	
	Over 800.	700 to 800.	600 to 700.	500 to 600.	400 to 500.	Over 14,000.	12,000 to 14,000.	10,000 to 12,000.	8,000 to 10,000.	6,000 to 8,000.	Over 100.	Under 100.
East Coast,	-	-	-	-	-	-	-	-	-	-	-	-
Egypt,	-	-	-	1	1	-	-	-	-	-	2	-
Mauritius,	-	-	-	-	1	-	-	-	-	-	1	-
Natal,	-	-	-	-	-	-	-	-	1	-	2	-
Reunion Islands,	-	-	-	-	-	-	-	-	-	-	-	-
Tunis,	-	-	-	-	-	-	-	-	-	-	-	-
West Coast,	-	-	-	-	-	-	-	-	-	1	-	-
<i>Europe.</i>												
United Kingdom,	11	10	7	19	66	163	-	-	-	1	18	73
Austria Hungary,	-	-	-	-	2	3	1	-	-	-	4	-
Balearic Islands,	-	-	-	-	-	-	-	1	-	-	-	-
Belgium,	-	-	-	-	4	6	-	-	1	-	-	-
Denmark,	-	-	-	-	1	5	-	-	-	-	3	6
France,	-	-	3	6	9	44	-	-	-	-	2	3
Germany,	-	1	-	4	2	12	2	-	-	1	24	20

Country	1913	1919	24	58	155	385	7	1	6	2	12	168	408	190
4)Ireland,	1	-	-	-	1	1	1	-	-	-	-	-	-	-
Greece,	-	-	-	-	-	1	1	-	-	-	-	1	-	11
Holland,	-	-	-	-	-	2	3	1	-	1	4	12	2	6
Italy,	-	-	-	4	2	5	7	-	-	-	-	3	14	2
Malta,	-	1	-	-	2	1	2	-	-	-	-	2	-	-
Norway,	-	-	-	-	-	-	10	-	-	-	-	6	18	14
Portugal,	-	-	-	-	1	-	4	-	-	-	-	-	1	-
Roumania,	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Russia,	-	-	-	-	2	2	2	-	-	-	-	6	14	9
Spain,	-	-	-	-	1	6	6	-	-	-	2	-	3	6
Sweden,	-	-	-	-	-	-	19	-	-	-	-	1	22	3
Turkey,	-	-	-	-	-	-	2	-	-	-	-	1	-	4
Totals,	13	19	24	58	155	385	7	1	6	2	12	168	408	190

Total graving docks,	.	.	.	.	.	684
Total floating docks,	.	.	.	.	.	194
Total slips, etc.,	.	.	.	.	.	508
Total all kinds,	.	.	.	.	.	1,443

NUMBER OF COMMERCIAL DRY DOCKS AT SOME OF THE PRINCIPAL PORTS OF THE WORLD

PLACE.	GRAVING DOCKS, CLASSIFIED BY LENGTH (FEET).						FLOATING DOCKS, CLASSIFIED BY LIFTING CAPACITY (TONS).						SLIPS, ETC. (FEET).		TOTALS.			
	Over 800.	700 to 800.	600 to 700.	500 to 600.	400 to 500.	Under 400.	Over 14,000.	12,000 to 14,000.	10,000 to 12,000.	8,000 to 10,000.	6,000 to 8,000.	Under 100.	Over 100.	Slips, etc.	Grav- ing Docks.	Float- ing Docks.	Slips, etc.	
<i>United Kingdom.</i>																		
Belfast,	1	-	-	-	1	2	-	-	-	-	-	-	-	-	4	-	-	
Birkenhead,	1	2	-	-	5	7	-	-	-	-	-	-	-	-	15	-	-	
Cardiff,	-	-	2	2	5	4	-	-	-	-	-	6	-	-	13	-	6	
Glasgow,	1	-	-	2	1	-	-	-	-	-	-	4	-	-	4	-	4	
Port Glasgow,	-	-	-	-	-	1	-	-	-	-	-	1	1	-	1	-	2	
Hartlepool,	-	-	-	1	-	4	-	-	-	-	-	1	-	-	5	-	1	
Hull,	-	-	-	-	1	5	-	-	-	-	-	6	-	-	6	-	6	
Leith,	-	-	-	1	-	7	-	-	-	-	-	-	-	-	8	-	-	
Liverpool,	4	2	-	-	6	3	-	-	-	-	-	-	-	-	15	-	-	
London,	2	-	-	-	10	18	-	-	-	-	-	3	-	-	30	-	3	
New Castle,	-	-	-	2	3	1	-	-	-	-	-	11	3	-	6	-	14	
Newport, Mon.,	-	1	-	2	-	4	-	-	-	-	-	1	-	-	7	-	1	
Queenstown,	-	-	-	-	1	4	-	-	-	-	-	1	-	-	5	-	1	
Southampton,	1	1	-	-	2	3	-	-	-	-	-	10	2	-	7	-	12	
Sunderland,	-	-	-	-	2	4	-	-	-	-	-	7	-	-	6	-	7	
Swansea,	-	-	-	-	2	6	-	-	-	-	-	1	-	-	8	-	1	

[illegible]

NUMBER OF COMMERCIAL DRY DOCKS AT SOME OF THE PRINCIPAL PORTS OF THE WORLD — Concluded.

PLACE	GRAVING DOCKS, CLASSIFIED BY LENGTH (FEET).						FLOATING DOCKS, CLASSIFIED BY LIFTING CAPACITY (TONS).						SLIPS, ETC. (FEET).		TOTALS.		
	Over 800.	700 to 800.	600 to 700.	500 to 600.	400 to 500.	Under 400	Over 14,000.	12,000 to 14,000.	10,000 to 12,000.	8,000 to 10,000.	6,000 to 8,000.	Under 6,000.	Over 100.	Under 100.	Grav. Docks.	Float. Docks.	Slips, etc.
Quebec,	-	-	1	-	-	2	-	-	-	-	-	1	2	-	3	1	2
St. John, N. B.,	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	3
St. John, N. F.,	-	-	-	1	-	1	-	-	-	-	-	-	-	-	2	-	-
<i>United States.</i>																	
Baltimore,	-	-	1	-	1	-	-	-	-	-	-	2	6	-	2	2	6
Boston,	-	-	-	-	1	3	-	-	-	-	-	-	4	-	4	-	4
New York and Brooklyn,	-	-	-	1	1	-	1	-	-	1	23	7	9	-	2	25	10
Hoboken,	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	8	-
Norfolk, Va.,	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	5
Philadelphia,	-	-	-	-	1	-	-	-	-	-	-	-	2	-	1	-	2
New Orleans,	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	4
San Francisco,	-	1	-	-	1	-	-	-	-	-	-	4	2	-	2	4	2
Savannah,	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2
Charleston, S. C.,	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	2
Wilmington,	-	-	-	-	-	1	-	-	-	-	-	-	2	-	1	-	2

[illegible]

GRAVING DOCKS OF WORLD.
800 Feet and Over, Bottom Length.

PLACE.	Name of Dock.	Extreme Length, Bottom Length.	Breadth at Entrance.	Depth over Sill, Ordinary High Water.	Proprietors.
Barry,	Commercial,	{ 867.5 } { 867.5 } { 825.0 } { 800.0 }	60.0	26.7	Barry Railway Company.
Belfast,	Alexandra,	{ 825.0 } { 800.0 }	80.0	25.7	Belfast Harbour Commission.
Birkenhead,	West float No. 1,	{ 830.0 } { 830.0 }	60.0	23.6	Mersey Docks and Harbor Board.
Glasgow,	Graving dock No. 3,	{ 830.0 } { 830.0 }	83.0	26.5	Clyde Navigation Trust.
Liverpool,	Langton No. 1,	{ 848.0 } { 848.0 }	60.0	24.8	Mersey Docks and Harbor Board.
Liverpool,	Langton No. 2,	{ 848.0 } { 848.0 }	60.0	24.8	Mersey Docks and Harbor Board.
Liverpool,	Canada,	{ 825.5 } { 825.5 }	94.0	31.8	Mersey Docks and Harbor Board.
Liverpool,	Herculanum,	{ 830.0 } { 830.0 }	60.0	22.8	Mersey Docks and Harbor Board.
London,	Tilbury No. 1,	{ 846.5 } { 846.5 }	70.0	35.0	London and India Docks Joint Committee.
London,	Tilbury No. 2,	{ 846.5 } { 846.5 }	60.0	30.0	London and India Docks Joint Committee.
Southampton,	No. 6,	{ 800.0 } { 800.0 }	90.0	33.0	London and Southwestern Railway Company.
Gibraltar,	-	{ 863.0 } { 850.0 }	95.0	38.6	Government (English).
Newport News,	Graving dock,	{ 102.8 } { 80.0 }	102.8 / 80.0	30.0	Newport News Ship Building and Dry Dock Company.

Between 700 and 800 Feet, Bottom Length.

Keyham,	No. 5,	745.0	95.0	36.0	Government (English).
Keyham,	No. 6,	741.0	95.0	47.5	Government (English).
Keyham,	Lock,	730.0	95.0	47.5	Government (English).
Barry,	No. 1,	{ 784.5 }	60.0	24.7	Barry Graving Dock Company.
Birkenhead,	No. 2,	750.0	48.3	26.6	Mersey Docks and Harbor Board.
Birkenhead,	No. 3,	750.0	85.0	26.6	Mersey Docks and Harbor Board.
Liverpool,	Herculanum No. 1,	758.5	60.0	22.8	Mersey Docks and Harbor Board.
Liverpool,	Herculanum No. 3,	708.0	60.0	22.8	Mersey Docks and Harbor Board.
Newport, Wales,	Tredegar dock,	{ 708.0 }	65.0	23.5	Mersey Docks and Harbor Board.
Southampton,	Prince of Wales,	{ 750.0 }	91.0	32.5	Tredegar Dry Dock and Wharf Company.
Bremerhaven,	Kaiser dry dock,	{ 708.0 }	98.3	35.3	London and Southwestern Railway Company.
Malta,	No. 2,	{ 741.5 }	-	-	State of Bremen.
Ceylon,	-	{ 720.0 }	85.0	32.0	Government (English).
Mare Island, U. S.,	-	{ 733.0 }	101.0	30.0	Government (English).
Philadelphia,	-	{ 732.0 }	104.0	30.0	Government (United States).
Portsmouth, N. H.,	-	{ 707.0 }	100.0	30.0	Government (United States).
San Francisco,	-	{ 725.0 }	103.5 {	32.5	San Francisco Dry Dock Company.
Boston,	-	{ 700.0 }	86.0 {	-	-
		{ 714.0 }	101.5 {	30.0	Government (United States).
		{ 730.0 }	76.0 }	-	-
		{ 729.0 }	-	-	-

LARGE FLOATING DRY DOCKS OF WORLD IN 1903.

PLACE.	Name of Dock.	Lifting Capacity (Tons).	Length (Feet).	Depth over Blocks (Feet).	Proprietors.
Pola,	-	15,000	460	28.5	Government (Austrian).
Port Mahon,	-	13,000	450	-	Government (Spanish).
Antwerp,	-	11,000	492	24.0	Le Vulcaïn Belge.
Hamburg,	No. 3,	17,000	560	25.0	Blohm & Voss.
Hamburg,	No. 4,	18,000	600	25.0	Blohm & Voss.
Hamburg,	-	11,500	508	22.0	Reihersstieg Schiffswerfte & Maschinenfabrik.
Stettin,	No. 1,	11,000	510	24.0	Vulcan Works.
Rotterdam,	No. 4,	14,000	557	27.0	City of Rotterdam.
Pensacola (Old Havana),	-	10,000	450	27.5	Government (United States).
Bermuda,	-	16,500	545	33.0	Government (English).
Hoboken,	United States No. 6,	10,000	525	22.0	Tietjen & Lang Dry Dock Company.
New Orleans,	-	18,000	525	28.0	Government (United States).
New York,	-	15,000	478	28.0	Morse Iron Works.
Portland, Oregon,	-	10,000	400	26.0	Port of Portland Commissioners
Amsterdam,	-	7,500	429	20.0	Amsterdam Dry Dock Company.

The most recent graving dock planned for the port of Liverpool is to be 800 feet long, with an entrance width of 135 feet; another dock, leading out of the Herculaneum dock, is building, 745 feet long. The extra width of entrance of the first-mentioned dock is due to the difficult approach rather than to the width of the vessels. It should be borne in mind that Liverpool already has the Canada dock, with a length of 925 feet, a width of entrance of 94 feet and depth on sill of 32 feet.

The most recent floating dock planned is one now under construction by the Maryland Steel Company for the United States naval station at Cavite in the Philippines. It is to be 500 feet long, 100 feet wide in clear between side walls, 30 to 35 feet deep over keel blocks, and lifting capacity of 16,000 tons, with free board of 2 feet.

Size of Steamships.

Letters of inquiry were sent to the owners of all steamship lines coming to Boston, asking for a statement of the size of their vessels, the probability of their requiring dock facilities in Boston harbor other than those already existing, the frequency and length of time vessels were usually in dock for painting and ordinary repairs, and the desirability of having repair shops and railways near to or alongside the dock.

Other letters were sent to ship-building concerns both in the United States and Europe, asking for similar information. Twelve replies were received to the first set of letters and twenty replies to the last.

The owners of the steamships frequenting the port which are too large to use the Simpson dock stated in answer to our inquiries that except in emergencies, such as injuries which could not be otherwise repaired, none of these would be docked in Boston even if there were a dock large enough to accommodate them, except in the case of steamships plying between Boston and Mediterranean ports which now dock there; and the only reason for making a change would be lower dock rates and repair charges. The above are all foreign-owned vessels.

**NAME, LENGTH AND TONNAGE OF STEAMSHIPS OVER 450 FEET LONG
ARRIVING AT THE PORT OF BOSTON DURING 1904, TO DECEMBER 1.**

NAME.	Number of Times entered	Length (Feet).	Gross Tonnage.
1. Oxonian,	4	459.0	6,306
2. Toronto,	4	456.0	6,035
3. Consuelo,	3	461.5	6,025
4. Kingstonian,	5	467.0	6,564
5. Bosnia,	3	485.0	7,436
6. Bengalia,	2	485.0	7,659
7. Belgia,	1	485.0	7,507
8. Bethania,	3	485.0	7,492
9. Michigan,	9	490.5	8,000
10. Utopia,	2	500.0	10,402
11. Bohemian,	9	512.0	8,548
12. Cestrian,	7	512.5	8,823
13. Canadian,	7	530.0	9,301
14. Winnifredian,	9	552.5	10,405
15. Devonian,	7	552.5	10,418
16. Romanic,	7	550.0	11,394
17. Republic,	8	570.0	15,378
18. Cretic,	10	582.0	13,518
19. Saxonia,	10	582.0	14,281
20. Ivernia,	10	582.0	14,058
21. Canopic,	7	578.3	12,097
22. Cymric,	10	585.0	13,096
	137		

None of the foregoing vessels would dock here for cleaning and painting, unless they might be trading between

Boston and some foreign port other than the home port, and these instances would be rare.

The Cunard steamships now building with turbine engines are to be 780 feet over all, 760 feet on the water line, 88 feet beam, 60 feet deep, and will require a depth over the dock sill of about 30 feet. The largest steamship in service is the "Baltic" of the White Star line, 708.3 feet long, 75.5 feet wide and 49 feet deep.

The following is a list of some of the largest steamships built since 1893, of which the "Cymric," "Saxonia" and "Ivernia" have been quite constantly in the Boston service : —

NAME.	Line.	Built.	Length (Feet).	Breadth (Feet).	Moulded Depth (Feet).	Gross Tonnage.	Displace- ment (Tons).
Baltic,	White Star,	1903	708.3	75.5	49.0	24,000	40,000
Minneapolis,	-	1903	622.0	73.5	41.5	20,718	-
Cedric,	-	1902	680.9	75.3	44.1	21,035	35,200
Kaiser Wilhelm II.,	North German Lloyd,	1902	684.3	72.3	40.2	19,361	28,000
Celtic,	-	1901	680.9	75.3	44.1	20,904	37,700
Kronprinz Wilhelm,	-	1901	637.3	66.3	39.3	14,908	21,300
Deutschland,	-	1900	660.9	67.3	40.3	16,502	23,620
Saxonia, Ivernia,	Hamburg American,	1900	582.0	64.5	38.0	14,200	-
La Lorraine, La Savoie,	Cunard,	1900	563.1	60.1	35.9	11,870	15,400
Oceanic,	French,	1900	685.7	68.3	44.5	17,274	25,500
Cymric,	White Star,	1899	585.0	64.3	37.9	13,096	-
Graf Waldersee,	White Star,	1898	561.2	62.2	37.7	13,193	-
Kaiser Wilhelm der Grosse,	-	1898	626.7	66.7	39.0	14,549	20,880
Kaiser Friedrich,	North German Lloyd,	1897	581.7	63.7	37.9	12,480	-
St. Paul, St. Louis,	-	1897	535.5	63.0	26.8	11,629	16,000
Campania, Lucania,	American,	1895	601.0	65.2	37.8	12,950	18,000
	Cunard,	1893					

How Many of the Large Vessels coming to Boston would use the Proposed Dock?

Vessels dock away from home only in emergencies. In the case of a damaged vessel brought into the port of Boston, usually a survey is first made, for which purpose she may be docked, and then tenders asked for making repairs. Owing to the surplus dock accommodations at New York, and to the fact that at Philadelphia, Baltimore and Newport News the docks are owned by the ship-building companies, the lowest bids are usually received from one of these places. After the contract for making repairs has been let, the ship may be held dry-docked at Boston while being patched or having temporary repairs made, and then allowed to proceed to New York or elsewhere for the permanent repairs. While this may result in delay and consequent loss to the ship owner, it enables the underwriters to effect the repairs at the least cost to the insurance company.

As a rule, the cost of repairs in foreign ports is much less than in the United States; in addition thereto, all steamship lines have at their home port a superintendent who has charge of the repairs and maintenance of vessels, which facts enable them to be repaired at the home port much cheaper and better than at a foreign port; wherefore, almost invariably if the damage to a vessel is such that she can reach her home port with temporary patching or repairs, she proceeds there for permanent repairs.

This, however, is not always true; as, for instance, one of the American line steamships built at Philadelphia was recently sent to Belfast, Ire., for a thorough overhauling, the cost of labor and the facilities being such that it could be done more cheaply there than at the yard where she was constructed.

The question, then, has the lack of a large dock kept or will it keep any vessels from coming here, is one to be considered.

The reasons for new lines or single vessels coming to a port are primarily the amount of merchandise to be received or shipped. No ship would go to a port simply because a dry dock existed there, except through necessity. If re-

munerative business were to be found at a port, vessels would go there whether the port had docking facilities or not. The only case in which they would have any bearing would be at places where the amount of business and rates were practically the same; for instance, if one port had no docking facilities, and another very good ones, preference would undoubtedly be given (other things being equal) to the well-equipped port.

It follows that the business of a large dry dock would be very limited in Boston, and practically it would only be called upon to dock vessels over 450 feet long that had met with some accident which rendered an inspection or examination below the water line absolutely necessary; and then in all probability it would be used simply for making such examination and temporary repairs as would enable the ship to reach some other port, where permanent repairs could be made at less cost. The number of ships of this length which entered Boston during the year 1903 was 37, and in 1904 was 22 * ; and not one of these on any passage was injured in such a way as to require the use of a dry dock.

What Type of Dock is Preferable.

From all the information which the Board has been able to obtain, it would appear that either a graving or floating dock would accommodate vessels in a satisfactory manner. Many ship owners and builders prefer one, and many the other. In some locations proper foundations cannot be readily secured for a graving dock, while in other places it would be difficult to obtain the necessary depth of water in which to locate a floating dock. The class and amount of business to be done have a material bearing in deciding which is better adapted to a particular locality.

A Floating Dock.

Wherever firm foundations cannot be readily obtained for a fixed dock, it is almost always practicable, by reason of soft bottom, to obtain the necessary depth of water for a

* See table opposite.

Table Showing Number and Length of
Different Steamers Arriving at the
Port of Boston from Foreign and
Domestic Ports during 1904

LENGTH FEET	FOR- EIGN	NUMBER OF EACH LENGTH																						DOM- ESTIC	
		-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		22
160 & LESS		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10
170	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1
180	2	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1
190	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1
200	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1
210		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
220	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
230	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
240	6	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	12
250	8	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
260	6	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	8
270	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	13
280	13	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	8
290	17	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
300	9	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
310	8	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
320	11	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1
330	17	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
340	16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
350	14	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
360	9	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
370	13	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
380	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
390	11	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
400	9	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
410	3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
420	6	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
430	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
440	8	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
450	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
460	3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
470	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
480		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
490	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
500	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
510	2	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
520		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
530	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
540		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
550	3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
560		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
570	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
580	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
590	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
TOTAL	241																								85

Note — x Foreign • Domestic

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floating dock. When a vessel is raised on a floating dock, she is above the level of the water, so that light and air have free access to her bottom, thus facilitating drying. Should a floating dock be built in sections, it could be so operated as to give an equal bearing to all portions of an old vessel, and thus avoid straining, however much her lines may have become distorted. Inasmuch as such a dock possesses less longitudinal stiffness than a graving dock, should the damage to be repaired extend over a considerable length of the vessel, it would be more difficult to keep her properly supported at all points than in a masonry dock.

A floating dock also could be moved about a harbor, or from one harbor to another, if necessary; it also could be careened so as to dock a vessel having a considerable list; but such an operation would be performed at some risk of injuring the dock.

A floating dock could, if required, partially raise a larger ship than it is designed to handle, so that repairs might be effected, as, for instance, around the propeller shafts, even if the whole vessel should not be raised out of the water. Further, it could lift a vessel much longer than itself, providing the vessel should have the necessary strength to stand the strain due to the non-support of an overhanging bow and stern.

While generally the first cost is less than a masonry dock, still, it wants more constant care and must be out of commission a longer time than a masonry dock, for the purpose of making these periodical inspections and repairs, and the cost of maintenance is greater. In fact, it must be borne in mind that a floating dock needs practically the same care as a ship, must be cleaned, painted and docked as frequently, and at all times requires a crew to look after it. The berth or basin in which the dock is operated also would periodically require dredging for its maintenance.

A Masonry Graving Dock.

Masonry graving docks require a solid foundation, and should be located, if possible, in rock or hard-pan formation. In such places it would be difficult to secure by arti-

ficial means the necessary depth of water for a floating dock of the same capacity.

A masonry dock, owing to its nature, when properly built should require very slight repairs, there being practically nothing to get out of order excepting the machinery and the gates or caissons closing the entrance. The maintenance of the machinery and its operation is less expensive than that of a floating dock, owing to its being installed and operated in large units in a single house. The same machinery also, where the docks are near together, is available for operating more than one dock, and, housed in masonry buildings, could be more readily taken care of and left with less immediate supervision than would be the case with floating docks. The amount of water to be pumped is greater with a graving dock; but if the pumps are properly proportioned, it need not take longer to dock a ship in a masonry than in a floating dock. The dock itself being fixed, and there being ample space around the vessel, she can be as easily, if not more readily, adjusted in place than in a floating dock. In case of infrequent use, the maintenance charges for the masonry dock would be very much less than for the floating dock.

In docking vessels for extensive repairs the masonry dock offers the best facilities for shoring up the vessel, and preventing her becoming strained or further injured. Where the range of tide is considerable, a large portion of the water in the dock could be allowed to drain out with the falling tide without the cost of pumping, unless it were desirable to clear the dock more rapidly.

In studying the tables showing the location of the various dry docks throughout the world, it will be seen that floating docks are generally in use where it is difficult to obtain proper foundations for masonry docks. In some ports very great expense has been incurred to secure such foundations. The opinions of ship owners, ship builders and experts, learned through letters of inquiry and from papers presented to the last National Navigation Congress, held at Dusseldorf in 1902, are herewith given somewhat at length, as testimony of the highest authority.

ANSWERS RECEIVED FROM SHIP BUILDERS AND SHIP OWNERS.

From the point of view of the vessel owner, what are the advantages or disadvantages between fixed masonry dry docks and floating dry docks?

Morse Dry Dock and Repair Company, Brooklyn, N. Y.—There is a difference of opinion, but the majority of steamship owners believe that the sectional floating dock is easier on the ship, as it conforms to her shape, while in the graving dock the ship is forced to the shape of the dock. Then, again, the cost of construction and operation of a floating dock is less. A ship can be docked in half the time it requires in a graving dock.

Maryland Steel Company, Boston.—The floating dock has the advantage over graving docks in being capable of adjustment to injured ships having any list or change of trim, and carries the ship easier than the rigid graving dock. In support of this I might call attention to the successful government tests in docking the battleship "Illinois" in the New Orleans floating dock, when there was neither cracking of the cement nor cutting of the blocks; proving that the tender bottom of even a battleship can be carried on a well-designed floating dock with an evenly distributed pressure and without a tendency to strain. The floating dock generally lifts a vessel in about half the time required by a graving dock, and, in lifting the vessel above water, permits the hull and paint to dry quicker; also, gives better light for carrying on repairs to the bottom of a ship.

The Neafie & Levy Ship and Engine Company, Philadelphia, Pa.—Owners have no objection to first-class floating docks, and they are cheaper. Workmen can see better in floating docks than in a deep masonry dock. Paint dries better on floating docks than in deep masonry docks. Simpson type fixed docks of timber are good for light and air. Many large steel pontoon floating docks are now used in all parts of the world.

Moran Bros. Company, Seattle, Wash.—The question as to whether a floating dock or a stone one permanently built in the ground is the best depends largely on the local conditions; as you probably know there are many places where the formation of the ground is such that it is an extremely expensive proposition to build a stone or concrete dock; and there are other places where a dock can be practically blasted out of the solid rock, and of course under those conditions the stone or concrete dock would be unquestionably the best. A floating dock is a very convenient way of handling vessels for repairs and painting; the vessel is above the surface of the water, which makes it convenient for

handling machinery to and from her, and it also brings her up where the wind and sun can have the best chance to dry her off in the quickest possible time for painting. But this whole proposition as to which would be the best for local conditions depends altogether on the conditions that exist; and it would be impossible for us to advise you in an intelligent way on this subject.

The Townsend-Downey Shipbuilding Company, New York. — Either type is satisfactory if properly constructed, equipped and operated. Trade and site should decide type of dock.

Union Iron Works, San Francisco. — Consider floating docks more desirable as repairs can be made more cheaply than on a graving dock.

Merchants and Miners Transportation Company, Boston. — The advantages of a floating dock over the graving dock are: the accessibility of the vessel, and, when the vessel is docked for painting, quicker drying on account of freer circulation of air.

Dominion Atlantic Railway, Boston. — From the ship owner's point of view, I should say none; from the dock owner's point of view, a great deal.

The Atlantic Works, East Boston. — We consider that this is largely a question of opinion. Painting and repairs can be done more advantageously in a floating dock. More skill and care are, however, required to safely place a vessel in a floating dock than are required in a fixed masonry dock.

Leven Ship Yard, Dumbarton, Scot., Wm. Denny & Bros. — Our answer to this entirely depends upon circumstances. Every place is not suitable for a floating dock, which requires a large water surface and plenty of water; but if these two conditions be granted, we are in favor of the floating dock: first, because the ground is not always suitable for constructing a dry dock, except at great expense, and also the length of the vessel is absolutely restricted by the length of the dock; whereas, in a floating dock, a certain additional length can be allowed to project over the ends.

Robert Stephenson & Co., Limited, Hebburn-upon-Tyne, Eng. — (a) The construction of a floating dock is considerably cheaper than one built of masonry.

(b) A floating dock can be so arranged that vessels can be docked on the side ways, saving considerable area of land; whereas in dry docks it is necessary that the dock must extend inland instead of parallel with the river bank, as in the case of pontoon docks.

Workman, Clark & Co., Limited, Belfast, Ire. — As to the advantages and disadvantages between masonry and pontoon docks, opinions are very varied; but we should say that, from an

owner's point of view, the pontoon is preferable, as it enables the vessel to be docked and undocked with greater speed, owing to the pumping being more rapid, and the fact that it is immaterial what the state of the tide is when the vessel is taken on or off.

Vulcan Steel Works, Stettin-Bredow, Ger. — For long passenger and freight steamers it is preferable to have a floating dock, divided into several sections; because the keel of these ships, especially of old ones, is no longer straight, and a floating dock accommodates itself to the form of the keel. For short, heavy ships, war ships, for instance, a dry dock is preferable.

Burmeister & Wains Machine and Shipbuilders, Copenhagen, Den. — Floating docks have the advantage of the air getting about the vessel. Graving docks have a rigid base for keel and bilge blocks, and are considered better for the larger class of steamers and battleships.

William Beardmore & Co., Limited, Glasgow, Scot. — Fixed masonry dock preferable.

Furness, Withy & Co., Limited, West Hartlepool, Eng. — (a) Floating dock: a floating dock is an economical dock to build, to start with, but you require (1) a very heavy draught of water; (2) also repairing quays in connection with the dock. These docks are very handy for doing ordinary painting jobs, but for large permanent repairs a masonry dock is the best.

(b) Masonry dock: a masonry dock is very much superior to a floating dock, always providing you have good foundations on which to build the dock. The up-keep of a masonry dock is very low indeed, providing the dock is well built, the foundations good, and the dock is in a good position.

Allan Line Royal Mail Steamships, Boston. — We have had no experience in floating dry docks, but they are generally considered as a good deal more risky, and serious accidents have happened with floating docks.

The Cunard Steamship Company, Boston. — For painting and ordinary repairs the floating dry dock is preferable, as affording much better circulation of air for drying the bottom, much better facilities for reaching your work, and much less loss of time in labor and expense of getting materials to the bottom or floor of the dock; as the floating dock is practically on level with the pier, while the masonry dock is many feet below the pier level.

For extensive repairs (such as having the keel removed or a large number of plates in the bottom renewed, — work requiring the steamer to be shored to keep her from straining) the fixed masonry dock is preferable for large steamers, as it has greater rigidity, and is less liable to strain the vessel.

Such work may be done on a floating dock; but, as the different sections of a floating dock are sure to be affected more or less by the movement of water under it, there is danger of straining where the steamer is large and the damage overlaps two or three sections. There is a lack of stability about it; and, if called upon to support a very heavy steamer for a period of weeks, it might recede a little in one or two sections from its original position, and this would almost surely result in straining to the steamer in the dock.

White Star Line, Boston. — We prefer fixed masonry dry docks, as being more reliable and efficient. We believe that a floating dry dock in this harbor could not afford the same depth of water as a masonry dry dock, and neither would it offer the same facilities for repair work.

The Clyde Steamship Company, New York. — All floating dry docks exert an irregular strain on ships, because it is impossible to keep the upward pressure at all sections uniform. Masonry or graving docks are free from this objection, and safer in every way.

The Metropolitan Steamship Company, Boston. — I am not aware that it makes much difference to the owner of steamships whether the docks are floating or masonry.

Eastern Steamship Company, Boston. — Don't know that there is a great advantage (from an owner's stand-point) in a fixed masonry over a floating dock; but my preference would be for the masonry dock.

Boston Tow Boat Company, Boston. — We favor fixed masonry dock.

The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa. — Our preference is for fixed docks.

Newport News Shipbuilding and Dry Dock Company, Newport News, Va. — Most vessel owners prefer to dock in graving docks.

Fore River Ship Building Company, Quincy, Mass. — From the point of view of the vessel owner, a fixed masonry dock involves less risk in docking and handling vessels to and from dock, and a greater convenience and despatch in handling heavy weights; whereas a floating dock offers some advantages in carrying on painting and light repairs, from the advantages of greater light and better air for drying, accessibility for men and light materials.

P. Verbeet, of Wm. H. Müller & Co., Rotterdam, Holland. — Graving docks or floating docks give both the same satisfaction, same risk or danger, and ship owners have no preference for either of these dry docks.

If the ground consist of rock or any other hard substance, which is proved not to allow penetration of water, and if rise and fall of the tides make a large difference in the water level, graving

docks are preferred on account of being able to get rid of a great amount of water without the assistance of pumps. In cases of soft bottom and little rise and fall of the tide (like in this port), floating dry docks are preferred.

Amsterdamsche Droogdok-Maatschappij, Amsterdam, Holland.—The advantage in a floating dock is, you can lay this dock wherever it is convenient; secondly, for painting or repairing purposes the ship stands dry and is round about well aired, as the ends of a floating dock are open; in the third place, a smaller cost.

The disadvantages of a graving dock are: it has to be made inland, with a canal leading to this dock, which is in many cases very expensive; secondly, it is always damp and unhealthy for the men to work in; thirdly, the ship's bottom is not so well visible and not so handy, especially for repairs.

Here in Europe ship owners and navigators rather dock in a floating dock than in a graving dock; in fact, we have of late had ships from English owners to dock with us, in preference over England.

A floating dry dock is certainly a useful instrument, especially with a repair shop near it; and, however this is not absolutely necessary, it is certainly an enormous advantage.

Our steel dock can be lengthened if necessary.

The way you have put the question induces me to make the following clear to you for a better judgment:—

A floating dock can be lengthened to almost any length; but please mind, that, although lengthened, the floating power *per foot* length does not increase. If you have a floating dock 400 feet long, able to lift 4,000 tons, and you would dock a steamer of say 4,000 tons and 200 feet long, then you could not do this, because, to enable you to apply the full capacity of this dock, it must then also be loaded over the full length. This, of course, applies only to floating docks, and not to graving docks.

A. Rodger & Co., Port Glasgow, Scot.—Think quite immaterial to ship owner whether vessel in dry dock or floating dock.

Vickers, Sons & Maxim, Limited, Barrow-in-Furness, England.—A dry dock of masonry is no doubt better and more lasting than a floating dock. The cost of the former is much greater, but the up-keep of the floating dock is more expensive. The floating dock has the advantage of more light and air under the vessel; also, if necessary, it could be taken to another port. From an owner's point of view, it is immaterial, provided the dues are the same.

Harland & Wolfe, Belfast, Ire.—If the floating dock is placed in a position where it is easy of access, there is not much difference

to the owner of a vessel; but the repairs to a floating dock are much more frequent and costly, and for a harbor trust the masonry dock is looked upon as the more desirable in this country.

OPINIONS IN REGARD TO FLOATING AND GRAVING DOCKS.

Mr. Howard C. Holmes, Consulting Engineer, San Francisco.—

The principal and only real advantage in floating over graving docks is that the vessel using the same is above the surface of the surrounding water, and open to the free circulation of air, which greatly facilitates the rapid drying of the bottom and painting; the other advantage, which applies only to docks not exceeding 2,500 tons capacity, is the first cost, or that of construction. The disadvantages are, first, cost of maintenance. In case of a wooden dock, the interior as well as the exterior must be protected from the ravages of the marine worms,—the *Teredo* and *Limnoria*. While this would not apply to a steel dock, the cost would be offset in the latter by the expense of protecting the various parts, braces, girders, bulkheads, piping, etc. (and their name is legion in a dock of any magnitude), against destructive oxidation from the action of salt water both inside and out. From data I have gathered from marine surveyors, it would be necessary to repaint every year for the first four years, and then at least every two years. This is especially true where there is any structural work, such as riveting and bolting. You can readily understand that any large structure composed of structural steel, riveted and fastened, exposed to the constant strain of the swells and strains brought upon it from lifting inert bodies, must require constant examination as to the condition of the various connections, and necessarily some repairs.

Herr Howaldt, Kommerzienrath, Kiel, Ger. (Report Int. Navigation Cong., Dusseldorf, 1902).—From all I have said we may come to the following conclusions: it is advisable to build floating docks in all those places where the soil is not especially well suited for building dry docks, as the former require the least building as well as working expenses; the composite docks combine the greatest profit with a safety equal to other systems; the floating dock has the greater advantage in comparison with a dry dock, the more the building ground renders it difficult to build the latter; the floating dock requires less working expenses than the dry dock in those places where there are vessels of all sizes to be docked; repairs are more advantageously and more easily executed in floating docks, and it will take less time for the bottom of a vessel to dry in a floating dock; and, lastly, there is no limit as to the length of vessels in the floating dock.

Herr R. Rudloff, Baurath, Bremerhaven, Ger. (Report Int. Navigation Cong., Dusseldorf, 1902). — It follows from the foregoing argument that the opinion prevalent among shipbuilders, that dry docks have had their day and will soon be a thing of the past, cannot be upheld by the faintest show of reasoning. The fallacy of their verdict is further proved by the numerous large graving docks which have been built within recent years, or are being built at present in England, Germany and many other parts of the world; otherwise, we should be unable to account for the decision of their builders and owners in any other way than that they must have personal motives against floating docks.

A strictly objective investigation of the question whether a dry dock or a floating dock is the more suitable dock for a certain locality will, by the light of the fact disclosed in this report, lead to the general conclusion we are about to enunciate. Of course there may be exceptional conditions to be considered; each individual case in practice will have to be dealt with and decided on its own merits, and certain local conditions may be such that they will outweigh all other considerations.

Private shipbuilding firms, who wish to possess a repairing dock of their own, will preferably choose a floating dock. As a rule, such a firm will be in a position to build a dock in their own yard, employ their own men and appliances, and save money thereby. They will be able to construct such a dock in much less time than a dry dock, and will therefore be sooner in a position to use the dock and earn money with it. Moreover, a floating dock can be moored off the shore, and will not occupy any site which can be utilized for other purposes. This is often a great advantage, because land may be very dear in the neighborhood of the ship yard, and the room may be cramped already. The consideration that a floating dock does not require a site on dry land, like a graving dock, may outweigh those of greater cost and shorter life of the former.

Private companies, on the other hand, who own a fleet of large steamers, will do better if they build a dry dock for their own use, as the construction of a floating dock will not offer to them the same advantages as to a shipbuilding firm.

Likewise, preference will always be given to dry docks everywhere they are wanted as an integral part of an expensive system of docks of a first-class harbor, unless the ground is exceptionally bad for the construction of a graving dock, or there is no land to be had for such purpose, or the configuration of the shore and adjoining land is such that dry docks cannot be built in a convenient position without interfering with the general

arrangement of the harbor. In every case where dry docks are to be built these should be made of ample size, even at the risk of somewhat increasing the working expenses. The fact deserves to be mentioned here, that the most recent practice in England is to construct, instead of two dry docks side by side, a single one of twice the length of a medium-sized dock, and to divide it into suitable sections, so that ships of various lengths can be docked in them without much extra pumping. Such a dock will no doubt fulfil all requirements of the port and neighborhood for a time, as regards the steadily growing tendency of making ships longer and longer every day; and yet it will also be able to accommodate shorter vessels without any undue increase in the volume of water to be pumped.

For harbors in newly opened up colonies, floating docks will of course be chosen in preference, as already stated, and dry docks only under exceptional circumstances constructed in these places, especially nowadays, when it is no longer considered a risky experiment to have floating docks finished complete in the home country, and to tow them with tug boats for thousands of miles across the ocean.

In a discussion at the International Engineering Congress, at Glasgow, in 1901, Admiral Sir Gerald Nowell remarked that undoubtedly the Admiralty preferred graving docks to floating docks; but that did not mean that floating docks had not a sphere of utility in places where graving docks were not possible. That he was at the Admiralty at the time that the new dock for Bermuda was projected. They tried to find a location for a graving dock, made borings everywhere, but could find no suitable place, and so had to fall back on the floating dock.

Only a Dock of the Largest Size would be justified Here.

As there now exists in Boston a dock capable of receiving vessels up to 450 feet in length, which is used but little more than one-half the time, there would seem to be limited need for the construction of another dock, unless it were capable of accommodating the largest vessel now coming or likely to come here in the future.

The new dock at the Navy Yard, 750 feet long, could accommodate any such vessel; and, unless it should be shown that the government dock would absolutely not be

available in cases of emergency, reasons for constructing another dock are not readily apparent. Should, however, another be built, it should be large enough, whether floating or graving, for the largest class of prospective steamships.

There is a prevalent opinion that no dock should be built by the Commonwealth to compete with local companies. Private enterprise should be given every inducement to carry on all classes of business, leaving to the Commonwealth the duties only of government.

If it is, as the merchants have testified, necessary to have a dry dock in the harbor, and private capital cannot see its way clear to construct it with a reasonable prospect of return, and the Commonwealth should decide to construct one, it should be so conducted as to furnish every possible facility for the repair of vessels, regardless of any expectation of a profit on the investment; and it should not be allowed to compete in any way with the business which existing private docks are capable of handling.

In former years, when the dock at the Navy Yard was the largest in the harbor, it was used a number of times for docking injured vessels which could not be taken into other docks; but in each case the permission for such use was granted only after the government was assured by the owners of the private docks that they could not dock the vessel.

Both for the protection of the vessel owner and the private dock owner, the rates at a Commonwealth dock should be substantially the same as those at the private dock in so far as these are based on a fair return for the cost of service and interest on the investment. It is probable that for many years the receipts would not pay the actual expenses of operation, and the interest and sinking fund requirements on the cost of construction would undoubtedly be an annual charge on the tax payers.

Inquiries were made by letter of the various dry dock companies as to the rates charged for docking vessels in different ports. From the replies received it was learned that the actual cost had very little to do with the rates

charged. In most places the docks are more or less intimately connected with the shops doing repair work, or are owned by the parties owning the wharves or wet docks, and are operated merely as an incident to the repair and general business. Thus the charge for the use of the dock is regulated to a greater or less extent by the amount of repair work to be done; or by special arrangement in connection with the use of wharves or wet docks occupied by vessels.

In New York, owing to the competition caused by there being more docks than are required for the business available, the charges are practically nominal, being in many cases as low as 3 or 4 cents per ton per day. The result of this has been that a number of the dry dock companies have become more or less financially embarrassed.

In general, the evidence goes to show that there is no regular fixed charge, but that each vessel is charged what the owner of the dock believes to be obtainable.

The published rates in some instances state the price for a moderate-sized vessel, and above that whatever the dock owner chooses to charge. The highest rate is 30 cents per ton per day for vessels under 3,000 tons, at San Francisco; and the lowest about 3 cents per ton, at New York. In England the published rates vary between 3 or 4 cents per ton per day, or from 12 to 15 cents for the first twenty-four hours and less for longer periods.

Location.

In deciding upon the best location for a dock, various conditions are to be considered. The foundation for a masonry dock should be rock or hard-pan; for a floating dock, clay or other material easily dredged, and in which a basin can be most easily maintained. The location should also be convenient of access to the vessel and to the workmen to be employed.

A floating dock should be in a sheltered locality, where it would not be liable to injury from storms, and where it could be readily moored without interfering with navigation. In either case the location should be conveniently connected with a plant for the repair of vessels and machinery. If

practicable also it should be such that tracks can be readily extended to it from a general railroad system.

If it be determined to construct a dry dock surveys and examinations should be made of different sites, including borings to ascertain the character of the foundation or material to be excavated. Accessibility to repair shops, railroad facilities and conveniences should also be considered, and a careful estimate made to fix upon the place where the dock could be constructed most economically; its initial cost, annual expense of maintenance and operation, as well as cost of making repairs to vessels, being important factors in the decision.

At Boston favorable foundations could be obtained at a number of different points for masonry docks, and a basin could readily be excavated on the Commonwealth flats at South Boston or elsewhere for a floating dock, so that it seems as if the decision as to which is better should rest on other reasons, viz.: the proximity of the location to repair plant and railroad accommodations; the frequency with which the proposed dock is liable to be used; the probable cost, and the possibility of obtaining favorable terms for its operation and maintenance; the opportunity for further enlargement; its relation to the wharves and channels of the harbor; and its accessibility from the business section of the city. At the same time, if, as seems probable at present, there should be but little demand for the use of a large dry dock at this port, the elements of annual charges, repairs and comparative indestructibility would be in favor of a graving dock rather than a floating dock.

Cost.

A masonry dock for Boston should be not less than 800 feet long, and a floating dock should be capable of lifting a load of 20,000 tons and have a length of not less than 600 feet. The cost of graving docks depends largely upon location and character of foundation, so that it is practically impossible to make a reliable estimate of the cost of a proposed dock simply by comparison with those already built. Docks of this character, as is shown by the tables

following, have cost from \$632 to nearly \$5,000 a foot; some of the more recent of the large-sized ones, built under average conditions, vary from \$1,500 to \$2,000 per foot. It has been impossible in many cases to separate the cost of the dock proper from the cost of the accessories, which were often included in the contract for its construction.

The cost of a steel floating dock is also a variable quantity; the larger ones, all of quite recent construction, vary from about \$52 to \$100 per ton of lifting power. A considerable part of the cost of some of these docks, however, was the expense of transporting them from the place where they were built to the port for which they were constructed. The cost of the three largest floating docks as given does not include the cost of preparing their berths.

For the above reasons, it is practically impossible to determine the cost of a dock for Boston until the location and type have been decided upon and the necessary examinations made; but in either case it would probably be not less than \$1,000,000, in addition to the cost of the site and its preparation.

TABLE SHOWING COST OF GRAVING DOCKS.

PLACE.	Name of Dock.	Proprietors.	Date finished.	Material of Construction.	Character of Foundation.	Length at Top Sill (Feet).	Depth over Sill (Feet).	Cost.	Cost per lineal Foot.
Norfolk, . . .	Navy Yard No. 1, . . .	United States government, . . .	1827	Granite, . . .	—	320	—	\$834,678	\$2,920
Boston, . . .	Navy Yard No. 1, . . .	United States government, . . .	1834	Granite, . . .	Piles in clay, . . .	400	25.0	1,972,000	2,450
New York, . . .	Navy Yard No. 1, . . .	United States government, . . .	—	Granite, . . .	Piles, . . .	369	—	1,820,130	4,980
St. Johns, N. F., . . .	Navy Yard No. 1, . . .	United States government, . . .	—	Wood, . . .	—	610	24.0	1,000	1,000
Norfolk, . . .	Navy Yard No. 2, . . .	United States government, . . .	1889	Wood, . . .	—	500	—	1,504,975	1,010
League Island, . . .	Navy Yard No. 1, . . .	United States government, . . .	1891	Wood-concrete coping, . . .	—	501	—	1,550,000	1,100
Port Royal, . . .	Navy Yard No. 1, . . .	United States government, . . .	1895	Wood, . . .	—	495	—	1,621,599	1,054
Puget Sound, . . .	Navy Yard No. 1, . . .	United States government, . . .	1896	Wood-masonry entrance, . . .	—	651	—	1,711,359	1,065
New York, . . .	Navy Yard No. 3, . . .	United States government, . . .	1903	Wood, . . .	Piles, . . .	668	—	1,794,372	1,190
Quebec, . . .	Levis dry dock, . . .	Government of Canada, . . .	1889	Stone-concrete, . . .	—	600	25.5	1,008,818	1,681
Halifax, N. S., . . .	—	—	1889	Stone-concrete, . . .	—	600	30.0	1,250,000	1,250
Sidney, N. S. W., . . .	Blouet's graving dock, . . .	New South Wales Government, . . .	1890	Stone-concrete, . . .	—	608	32.0	1,339,000	2,200
San Francisco, . . .	San Francisco dry dock, No. 2, . . .	San Francisco Dry Dock Company, . . .	—	Stone-concrete, . . .	—	750	32.5	4,474,000	632
Bremerhaven, . . .	Kaiser dry dock, . . .	State of Bremen, . . .	1899	Concrete, faced with stone, . . .	—	755	35.3	2,952,000	1,261
Belfast, Ire., . . .	Alexandra dock, . . .	Belfast harbor commissioners, . . .	1899	Stone and concrete, . . .	—	825	25.7	6,730,000	655
Kobe, Japan, . . .	Dry dock, . . .	Kawasaki Dock Yard Company, . . .	1902	Concrete, faced with stone, . . .	Piles in compact sand, . . .	428	24.0	1,891,000	2,080
Portsmouth, N. H., . . .	Navy Yard No. 2, . . .	United States government, . . .	Building, . . .	Granite and concrete, . . .	—	750	30.0	1,087,956	1,450
Norfolk, . . .	Navy Yard No. 3, . . .	United States government, . . .	Building, . . .	Granite and concrete, . . .	—	755	30.0	1,200,000	2,000
Marblehead, . . .	Navy Yard No. 2, . . .	United States government, . . .	—	Stone and concrete, . . .	—	750	30.0	1,153,283	1,580
Boston, . . .	Navy Yard No. 2, . . .	United States government, . . .	—	Stone and concrete, . . .	—	750	30.0	1,051,518	1,234
Newport, Eng., . . .	—	—	1890	Concrete, . . .	—	350	30.5	1,125,000	1,560
Glasgow, Scot., . . .	No. 3 graving dock, . . .	Clyde Trust, . . .	1893	Concrete, . . .	—	880	26.5	1,153,400	1,310
New York, . . .	Navy Yard No. 2, . . .	United States government, . . .	—	Concrete, . . .	Piles, . . .	471	—	1,171,955	2,484

¹ Report of Secretary of Navy, 1903.

² "Engineering News," June 28, 1903.

³ Department Public Works, Canada.

⁴ H. C. Holmes, Chief Engineer, San Francisco Dry Dock Company.

⁵ Dueseldorf International Navigation Congress, 1902, paper by R. Rudloff; includes dock land equipment and two fifty-ton cranes.

⁶ "Engineering," July 17, 1903. Belfast Harbor Commissioners. Includes two adjacent wharves.

⁷ "Engineering," July 24, 1903.

TABLE SHOWING COST OF FLOATING DRY DOCKS.

Place.	Name of Dock.	Proprietors.	Date built.	Material.	Length (Feet).	Width between Walls (Feet).	Draft (Feet).	Draft of Vessel (Feet).	Lifting Capacity (Tons).	Cost.	Cost per Ton Lifting Power.	Weight of Dock (Tons).	Cost per Weight of Dock.
New Orleans.	Algers.	United States Government.	1901	Steel.	525	100	47	28.0	15,000	\$809,712	\$54.00	5,850	\$139
Havana.	-	-	1897	Iron.	450	82	45	27.5	10,000	\$1,000,000	100.00	5,000	200
Bermuda.	-	-	1902	Steel.	545	100	-	32.0	15,500	\$875,000 \$1,350,000	62.90 87.00	6,500 6,500	150 208
Philippine Islands.	-	United States Government.	1908	Steel.	500	100	-	32.0	16,000	\$1,124,000	70.25	-	-
Rotterdam.	Docks Nos. 1 and 2 used as one.	Municipality.	1883	Iron.	453	-	-	-	6,000	\$441,000	52.25	3,700	119
Rotterdam.	Dock No. 3.	Municipality.	1892	Iron.	361	-	-	-	6,000	\$328,725	45.43	3,800	86
Rotterdam.	Dock No. 4.	Municipality.	1903	-	557	95	-	27.0	14,000	\$486,000	34.75	-	-
Amsterdam.	Dock No. 1.	Amsterdam Dry Dock Company.	1899	-	429	78	-	20.0	7,500	\$281,400	37.50	-	-

¹ Contract price, report Secretary of Navy, 1903.

² Approximate, "Engineering News," Dec. 16, 1897.

³ In England, "Engineering," Sept. 13, 1901.

⁴ In Bermuda, "Engineering," Sept. 13, 1901.

⁵ Contract price, to be completed in 1906, "Engineering News," Dec. 10, 1903.

⁶ Includes preparation of berth and subsidiary works, Dusseldorf International Navigation Congress, 1902; report by C. Noble, engineer, public works, Rotterdam.

⁷ Including dock port, letter of P. Verbeet.

⁸ Letter of Amsterdam Dry Dock Company.

There is unquestionably a strong feeling abroad in the community that the port of Boston should be provided with docking facilities for the largest class of vessels of commerce ; and that, if the dry docks at the Navy Yard are to be so fully occupied by war vessels as in all probability not to be open to use by merchant vessels, then one outside the Navy Yard should be built. And, further, that if the probability of earning interest money on the cost of building is insufficient to attract private capital, then the Commonwealth ought to defray the cost, with the hope that the indirect benefit will be sufficiently large to justify the outlay. The argument is based on the claim that the business of a great port is largely dependent on the accommodations and facilities afforded for its transaction, and that a large dry dock is one of the essentials of an up-to-date equipment. As a general proposition this must be admitted to be true, and a large dry dock would be a very desirable acquisition to the port.

Whether a transportation company, if it could do its business here with greater economy and despatch by means of larger vessels than those in use, would be deterred from sending such vessels here for fear of meeting with disaster which could not be repaired for lack of adequate facilities, is extremely doubtful, if not incredible ; and yet we realize that no port can be said to be fully and adequately equipped for business that lacks docking facilities for injured vessels, and that it tells in a way against a port if a damaged vessel is obliged to seek her repairing elsewhere.

It cannot be called a necessity in this instance, but rather a great convenience, such as pertains to a perfectly appointed household, and the lack of which would in all but extreme occasions pass unnoticed. It is analogous to the need of an emergency hospital in a small town, which might not be wanted in a year, whereas in a large city it would meet with a daily or hourly call. Its need has also been likened to the payment of an insurance premium to a casualty insurance company, so that in case of accident provision for care and repair would be at hand. All the arguments go to show that it would be in itself a desirable acquisition.

It is true that 22 different steamships, all too large for

Simpson's dock, came to Boston in the aggregate 137 times in 1904 without meeting with an accident which made it necessary to dock for repairs; and yet the risk was constantly with them on every voyage, and will be with them on every voyage they may hereafter make to this port.

It comes, therefore, to the question of whether it is wise to spend the people's money for this purpose. To build a graving dock 800 feet long would cost from a million to a million and a half dollars. A masonry dock of that class would have a long life. The old one at the Charlestown Navy Yard, after sixty-seven years, is in good condition, and but small repairs have been needed. If fifty-year bonds were issued for the larger sum, with interest coupons at 3 per cent., and about 1 per cent. for sinking fund, an annual sum of 4 per cent., or \$60,000, would be required to be raised by taxation, less such net income as the dock might earn. Any estimate of such net income would be purely guess-work, and it would therefore be safe to assume there would be none for the present, at least. The final question then is, can the Commonwealth afford to pay \$40,000 to \$60,000 a year for some part or the whole of the next fifty years, with the hope of stimulating activity in the foreign commerce of the port of Boston by supplying an adequate depot for repairing the largest steamships so injured as to be unable to return to the home port without making substantial repairs?

While the investigation has evolved the issue into one purely of ways and means, it has not satisfied this Board that the probable use of a dry dock in the near future, or the general advantages in the way of attracting additional foreign commerce to this port, or the reduction of freight rates, would warrant so large an expenditure of public money.

The appropriation under the resolve was \$5,000; expended \$435.50.

APPROPRIATION FOR SURVEY AND IMPROVEMENT OF HARBORS.

By chapter 28 of the Acts of 1903, an appropriation of \$10,000 was made for surveys of harbors and for improving and preserving the same, and for repairing damages occa-

sioned by storms along the coast line or river banks of the Commonwealth.

The following expenditures from this appropriation were made in December, 1903, under the authority of section 9 of chapter 96 of the Revised Laws : —

Easterly shore of Dorchester,	\$111 22
Connecticut River, Hadley,	442 87
Total,	<hr/> \$554 09

In 1904 the appropriation for the same purpose was \$5,000, from which sum expenditures have been made during the year in the localities and to the amounts following, viz. : —

Bass River, South Yarmouth,	\$148 09
Connecticut River, Agawam,	11 86
Connecticut River, Hadley,	2,511 74
Cotuit harbor,	188 78
Easterly shore of Dorchester,	32 42
Green Harbor,	71 65
Lake Anthony,	11 35
Menamsha Inlet,	119 55
Red River, Chatham,	81 42
Vineyard Haven harbor,	234 97
West Bay, Osterville,	426 74
Weymouth Fore River, Quincy,	11 20
Witchmere harbor,	63 25
Total,	<hr/> \$3,913 02

HARBOR COMPENSATION FUND.

There was paid into the treasury of the Commonwealth during the year, under chapter 146 of the Acts of 1897 and chapter 96 of the Revised Laws, for tide water displaced by work done under licenses granted by the Board and for rights and privileges granted in tide waters and great ponds, the sum of \$8,125.86, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1904, was \$424,749.39; the balance of income from this fund in the treasury on the same date was \$12,772.41; the total income for the year was \$15,409.33.

COMMONWEALTH'S FLATS IMPROVEMENT FUND.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1903, was \$1,366,243.55. To this has been added during the year \$46,545.33 from the income of the fund and \$26,857.85 from sales and rents of lands and other sources, making a total of \$1,439,646.73. Of this sum there has been expended during the year \$124,632.06, leaving a balance on Nov. 30, 1904, of \$1,315,014.67, subject to reduction for existing liabilities by reason of the anchorage basin contracts under chapter 476 of the Acts of 1901, and for contribution toward building Northern Avenue and bridge under section 4 of chapter 381 of the Acts of 1903.

The foregoing report is respectfully submitted.

WOODWARD EMERY,
CHARLES C. DOTEN,
GEORGE E. SMITH,
Commissioners.

DEC. 1, 1904.

APPENDIX.

APPENDIX.

[A.]

[See page 4 of this report, *ante*.]

CONTRACTS.

The contracts entered into during the year are as follows : —

1903.		
Dec. 29.	With Samuel N. Ames, Joseph P. Hallett and Jehiel R. Crosby, for constructing a new entrance to East Bay, in Osterville, — amounting to	\$5,674 10
1904.		
Jan. 13.	With the Eastern Dredging Company, for dredging the westerly end of Bird Island shoal, nearly opposite Pier 7, Grand Junction Wharves, East Boston, — amounting to	3,604 90
Jan. 28.	With the Bay State Dredging Company, for dredging a channel and anchorage basin in Dorchester Bay, between Savin Hill and Commercial Point, — amounting to	24,334 02
Feb. 2.	With Charles H. Souther and John H. Gerrish, for dredging channel at Bass River, in Beverly, involving the expenditure by the Commonwealth of	25,000 00
Feb. 26.	With Thomas E. Ruggles, for building an extension to a pile wharf belonging to the Commonwealth and leased to the Boston Molasses Company, on the South Boston flats, — amounting to	4,300 00
April 4.	With the Harries & Letteney Company, for dredging a channel at Wollaston Beach, in Quincy Bay, — amounting to	7,000 00
April 8.	With the Roxbury Central Wharf Company, for dredging a channel across the southerly end of South Bay, — amounting to	8,000 00
June 2.	With Kiely and Gleason, for building dikes on the Connecticut River, at Hatfield, — amounting to	4,302 50

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1904.

July 29.	With Ruggles & Perkins, for removing rocks from the entrance to Cotuit harbor, — amounting to .	\$1,837 00
July 29.	With John H. Gerrish, for dredging in Lake Anthony, at Cottage City, — amounting to .	8,361 87
Aug. 2.	With Thomas & Connor, for building a timber jetty at Bucks Creek, in Chatham, — amounting to	858 00
Total,		<hr/> \$93,272 39

[B.]

[See page 51 of this report, *ante*.]

REPORT OF THE SUPERINTENDENT, PROVINCE
LANDS.

PROVINCETOWN, MASS., Nov. 30, 1904.

To the Board of Harbor and Land Commissioners.

GENTLEMEN:—As superintendent of the Province Lands, I respectfully submit the following report for the year ending Nov. 30, 1904.

The work on these lands has been prosecuted substantially as in former years, by the transplanting of beach grass and the planting of young trees and shrubs.

The season's work began about the first of April, by transplanting bayberry and other shrubs on those areas covered in former years by the transplanting of beach grass. In addition to bayberry and other shrubs, about 12,000 young pines taken from the nursery and adjacent woods, and about 30,000 European alders imported for this work, have been placed. The latter, judging from experiments made with it, will doubtless prove of value. The above work was continued until about the middle of June, when it was suspended until about the middle of September and then resumed. The transplanting of beach grass and bayberry was carried on until the 15th of November, covering during the whole period about 30 acres, and extending the work eastward from Grand View toward the eastern boundary line of the lands.

In addition to the above work, necessary repairs have been made on the road, which extends across the lands a distance of 2 miles, and, as it is built of sod and is much used by the public, especially during the summer months, requires close watching and careful attention. Its present condition is very satisfactory.

There is marked improvement from year to year in the condition of the territory covered during the several seasons since the commencement of operations, the various kinds of shrubs and trees making very satisfactory growth, considering the barren condition of the soil and the nature of the work. Since reclamation and improvement was commenced, about 240 acres have been covered

with beach grass ; and wherever this has been done it has stopped the drifting of the sands, which were rapidly advancing upon the wooded sections of the reservation lying between the sand dunes and the town of Provincetown. Within the above area there have been introduced quite extensively various kinds of shrubs and trees, which with careful attention and small expense will show gradual improvement from year to year until the area becomes permanently fixed.

About 75 acres of barren sand dunes still remain unreclaimed, including the balance of the centre range and the many small sections scattered throughout the reservation. This should receive immediate attention, to stop the drift of sand thereon, as the longer these sections remain uncovered, the more extensive the area becomes and the faster the drift.

It is estimated that about three years from June, 1905, will be sufficient time within which to reclaim the remaining area, and thus place it in condition to withstand the effects of severe storms.

Much interest in the work is still manifested by the United States Department of Agriculture, and J. M. Westgate of that department, author of Bulletin No. 65 on "Reclamation of Cape Cod sand dunes," has spent much time in examining the plans and methods adopted by the Commonwealth, and the results obtained.

Respectfully submitted,

JAMES A. SMALL,
Superintendent of the Province Lands.

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TWENTY-SEVENTH ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND
COMMISSIONERS.

FOR THE YEAR 1905.



BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
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TWENTY-SEVENTH ANNUAL REPORT

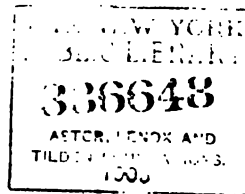
OF THE

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FOR THE YEAR 1905.



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WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1906.



APPROVED BY
THE STATE BOARD OF PUBLICATION.

Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1905, covering a period of twelve months, from Nov. 30, 1904, being the twenty-seventh annual report of the Board since its establishment by chapter 263 of the Acts of 1879.

From Dec. 1, 1904, to Nov. 30, 1905, the Board has held 211 meetings, has given 305 formal and informal hearings, and has received 161 petitions for license to build and maintain structures and for privileges in tide waters, great ponds and Connecticut River, to dredge material, to remove material from beaches, and for other purposes.

One hundred and six licenses for structures and privileges in tide waters, great ponds and Connecticut River have been granted during the year; also 48 permits for dredging, for the removal of material from beaches, and for other purposes.

Forty-eight inspections have been made at various times by and under the direction of the Board, of work completed and in progress; also of sites of authorized work, under appropriations made by the Legislature, relating to: dredging operations in Boston harbor; improvements on the Commonwealth's flats at South Boston; the reclamation of the Province Lands in Provincetown; protective works on Connecticut River at Agawam, Hadley, Hatfield and West Springfield; Bass River in Beverly; wall and jetties at Stony Beach in

Hull; Stage harbor and Bucks Creek in Chatham; jetties and channel at Menamsha Inlet; jetties and channel at Lake Anthony; Vineyard Haven harbor; jetties and channel in Bass River at South Yarmouth; Lewis Bay in Yarmouth; East and West bays at Osterville; Cotuit harbor; Witchmere harbor in Harwich; Apponagansett harbor; Herring River in Harwich; Nantucket harbor; Cuttyhunk harbor; Paskamansett River in Dartmouth; site of proposed breakwater in Revere; Nashawena Island; also upon petitions and plans presented to the Board of the sites of proposed work in tide waters, the location of wrecks and obstructions to navigation; various structures built under licenses from the Board; sites of alleged dumping of material into tide waters; town boundary survey work; State boundaries.

Through transactions of the Board there has been paid into the treasury of the Commonwealth during the past year, from rents, licenses, sales of land and other sources, and credited to the Commonwealth's flats improvement fund and the harbor compensation fund for Boston harbor, the aggregate sum of \$133,563.42.

During the year the Board made 13 new contracts,* involving the estimated expenditure of \$72,741.88.

BOSTON HARBOR.

Combined activity is essential to success in the competitive business of the present day. The greatness of the port of Boston is dependent not only on deep and commodious water ways, but upon the volume of business that can be attracted hither.

While the railroads are and must continue to be the great originators as well as transporters in enlarging the volume of exports, the merchants are the ones upon whom rests the responsibility of enlarging the volume of imports. It is a truism to assert that these volumes have interdependent trade relations.

The twelve months ending Nov. 30, 1905, show a value at the port of Boston of imports amounting to \$106,993,964.

* See Appendix A.

and of exports, both domestic and foreign, of \$90,715,904, which together sum up \$197,709,868. Of this, the total foreign exports were \$839,628.

During the same period the coastwise tonnage of vessels entering and leaving the port was as follows, viz.: 5,618 vessels of all kinds from southern ports registered a gross tonnage of 6,262,217, and 3,322 vessels from eastern ports 2,530,415, or a total of 8,792,632; while the foreign net registered tonnage of 165 American vessels was 219,361 and of 1,349 foreign vessels was 2,559,528, or a total of 2,778,889.

A new steamship line, between this port and China, Japan and Singapore, or rather an extension of the service that has heretofore been plying to New York, has been established, and the first steamer arrived here November 24.

The Elder-Dempster line has announced the establishment of a line between Melbourne and Boston, with monthly sailings, but the first steamer has not as yet left Australia.

Our coastwise lines have been increased by the addition of the Maine Coast Transportation Company, which operates two steamers between here and ports of the State of Maine.

Of course freights, whether outward or inward, are relatively less at the port where the steamships can find a return cargo. Boston should be developed as a great entering and forwarding port for the cities of the mid-sections of the country. Importing merchants of the interior should be generally and continuously informed of the advantages in the way of speedy and courteous custom house examinations, economies in handling and facilities for inland transportation at reasonably low freights which may be enjoyed by patronizing this port.*

While the Federal government is deepening and widening the harbor channels and the Commonwealth is improving the anchorage basins and increasing the wharf accommodations, the merchants should persevere in providing the business, that nothing may be done in vain, and that working together the largest results may be accomplished concurrently with

* It is worthy of note that importations through the port of Boston during the fiscal year of 1905 increased 24 per cent., as against a gain of 13 per cent. at New York and about 12 per cent. at Philadelphia.

the greatest economy toward holding the chief port in New England as the second in importance in the country.

Foreign commerce is a great educator, and the more of it we try to get and have to deal with, the earlier shall we begin to discover some of the problems essential to be understood in order to guide it in a desired direction.

Unwise legislation may interfere with its rapid development. Antagonistic interests may procure the establishment of obstacles. Uncontrollable differentials may assist in the diversion of exports to harbors less safe and easy of access and farther from foreign ports of destination. But the port of Boston is unalterably fixed in its physical and geographical relationship to the vast interior of this continent and in the path of easy transit to the eastern hemisphere.

What can be done by the Legislature of the Commonwealth and the merchants of greater Boston should be, in determining the right influences of legislation, both State and national, which, by aiding and not obstructing the laws of economical and commercial growth, may shape advancement on lines of safe and sure progress, while avoiding the errors of ignorance.

A decade ago a commission was appointed to investigate the wants of Boston for improved docks, wharves and terminal facilities. In January, 1897, the commission made its report to the Legislature, recommending on the part of the Commonwealth public ownership of a portion of the fore shore; the building of a great pier with a proper avenue of approach; the improvement of the anchorage basins; changes in the railroad tracks and terminals at East Boston; also the improvement of the harbor channels and the building of a large dry dock at the Navy Yard by the Federal government.

The recommendations were timely; already had begun the change in the draft and carrying capacity of transatlantic steamships, which marked the advance in requirements for channels, docks, basins and piers far in excess of any demands hitherto made.

A comparison of sizes of the mail steamships built by the Cunard Company within the last forty years may be interesting and instructive: —

	1865. "Java."	1884. "Umbria."	1905. "Carmania."
Length,	337'	500'	672' 6"
Breadth,	42' 6"	57' 3"	72'
Depth,	27' 7"	39'	52'
Gross tonnage,	2,697	8,127	19,524
Indicated horse-power, . .	2,650	14,500	21,000
Speed in knots,	14	19.5	19

The weight or displacement of the "Carmania" when loaded to a draft of 33' 3 $\frac{1}{4}$ " is calculated to be 30,918 tons. It is said that there is no indication at present that transatlantic steamships have reached their ultimate development as to size, and the recent application of the epoch-making steam turbine for power in place of the reciprocating engine surely adds a new and uncertain factor in any calculations.

To anticipate the requirements of the largest class of vessels, the harbor channels had to be widened and deepened, and the projects for improvement by the Federal government were made to keep pace with the movement. The economic advantages of larger vessels became so conspicuous as to extend their influence to the coastwise carriers, and the coal and lumber schooners increased beyond the five mast limit to six and even to one of seven masts, with a loaded draft of 28 feet when carrying 8,000 tons of coal. This increased draft led directly to a desire for greater depth of water when lying at anchor, and thus the anchorage basin project off Bird Island flats became an early necessity; and where formerly that well-known anchorage area had but an average of about 13 to 18 feet at mean low water, there is at present a depth of 30 feet over the area thus far completed. By the time the existing projects of both the State and national governments are carried out, others will be needed to enable the accommodations and required facilities to keep pace with the demand and maintain the port as one of the first order.

The original project for improving the channels of the harbor was adopted by Congress in 1867. The lower main ship channel below President Roads had then in places a width of only 150 feet, with a depth of 23 feet; and the upper main ship channel above President Roads had a least width of 100 feet and a least depth of 18 feet. In 1892 the Federal government proposed to widen these channels to 1,000 feet, with a depth at mean low water of 27 feet. This project is substantially completed.

In 1899 the project of making a new channel entrance to the harbor through Broad Sound, 30 feet deep and 1,200 feet wide, was adopted. That channel is now completed, and a lighthouse at its entrance has been erected on the Graves, from which the light was first exhibited Sept. 1, 1905, completing, with the range lights on Lovells Island for the seaward arm, and on Spectacle Island for the inner arm, the lighting of that channel. In 1902 the project of deepening the upper channel above President Roads to 35 feet, with a width of 1,200 feet, and of cutting an entirely new channel through Broad Sound, 35 feet deep and 1,500 feet wide, was adopted. In carrying out this project it was thought best to split it lengthwise; and now the upper channel is being dredged 600 feet wide, or one-half the width; and when completed so as to give access to the steamship and railroad wharves, the other half will be undertaken. Thus the commerce of the port will not be delayed for the completion of the whole project before enjoying some of the benefits intended. It is expected that the dredging of the limited width of channel 35 feet deep from the sea to the wharves will be completed by Dec. 31, 1907. The completion of the entire project of 1902, however, will not afford free access to the wharves of the New England Railroad company and the Commonwealth pier; but it will be necessary to increase the width of the main ship channel some 700 to 800 feet for a length of half a mile, in order to provide an approach similar to that enjoyed by the other railroad and steamship wharves in the harbor above. This additional project should be urged before Congress in due time.

ANCHORAGE.

By chapter 476 of the Acts of 1901, the Board was authorized to excavate a basin and to build and maintain structures in Boston harbor northerly of the main ship channel, for the purpose of providing mooring facilities and additional anchorage ground. The expenditure of \$1,000,000 was authorized by this act, not more than one-fourth part to be expended in any one year.

In 1902 contracts were entered into for dredging an area lying along the northerly side of the main ship channel in the upper harbor, covering about 1 mile in length and 1,000 feet in width, to a depth of 30 feet at mean low water; and for the purpose of doing the work economically and expeditiously, the total area was divided into four sections of nearly equal areas and excavation.

Since the report of last year an additional amount of 160,021 cubic yards has been excavated wholly from sections 1 and 2, leaving 443,814 cubic yards yet to be dredged. In sections 3 and 4 about 581,217 cubic yards are yet to be removed.

The reason of the slow performance by the contractors is their having contracts with the Federal government for excavating portions of the main ship channel of Boston harbor; and, inasmuch as the government project and its completion seemed to the Board of paramount importance, it has refrained from taking severe measures to compel the progress of the work on the anchorage basin while all the dredging machines of the contractors were engaged in the work of the government on the main ship channel.

The space available for the anchorage of deep-draft vessels has been materially increased, and as yet there seems to be no suffering for lack of larger area on account of the delays.

The approximate amount of material, scow measurement, remaining to be excavated from each section, and the total amount, scow measurement, excavated to Dec. 1, 1905, are as follows: —

	Total Amount excavated to Dec. 1, 1905 (Cubic Yards).	Approximate Excavation to be made (Cubic Yards).
Section 1,	553,784	189,716
Section 2,	495,202	254,098
Section 3,	440,783	302,917
Section 4,	474,100	278,300
Totals,	1,963,869	1,025,031

The total amount expended on this project to Dec. 1, 1905, is \$275,707.07.

DORCHESTER BAY.

The dredging of anchorage basins in Dorchester Bay, off the southerly shore of South Boston, authorized by chapter 425 of the Acts of 1902, has continued during the year under contract with the Eastern Dredging Company and the New England Dredging Company, jointly, made Oct. 29, 1902, at the price of 21 cents per cubic yard, measured in scows, the work to be done during the years 1902-03-04-05, and the expenditure not to exceed \$25,000 in each year. The contract provided for the completion of the work June 15, 1905, and for the excavation of two areas respectively known as the 9-foot area and the 6-foot area. The 6-foot area is located near the L Street bath house and the landing of the Mosquito Fleet Yacht Club, and the dredging of this area was completed early in June, 1905.

The dredging of the 9-foot area, located near the public landing of the South Boston and Boston Yacht Club houses, was unavoidably delayed, and could not be completed at the date specified, an area of about 375,000 square feet still remaining to be excavated. The work was suspended June 15 for the summer, in order that the dredge and mud scows might not interfere with the use of the area by the yachts. The remaining work will be completed during the winter and spring, so that the whole area will be available

for anchorage before the beginning of the next yachting season.

During the year 105,965 cubic yards have been excavated, making a total of 445,214 cubic yards to Dec. 1, 1905. The total amount expended to the same date is \$82,648.96. The balance of the appropriation will be expended in completing the work.

DREDGING EASTERLY SHORE OF DORCHESTER.

Under authority of chapter 439 of the Acts of 1903 the channel leading from the main channel of Neponset River was enlarged in 1904, and extended northwesterly from the main channel about 700 feet, 75 feet wide on the bottom and 12 feet deep at mean low water. An anchorage basin for the use of yachts was also dredged between Savin Hill and Commercial Point in this locality, covering about $4\frac{1}{2}$ acres, 9 feet deep at mean low water, the total amount expended for this improvement to Dec. 1, 1904, being \$25,363.66.

By chapter 453 of the Acts of 1905 the Board was authorized to dredge the channel leading from Commercial Point in a northwesterly direction, in extension of the channel dredged under authority of chapter 439 of the Acts of 1903, to a depth not exceeding 12 feet at mean low water and to a width not exceeding 75 feet, the act of 1905 permitting the expenditure of \$5,000 therefor in the year 1905, and the same amount in 1906.

Proposals for dredging a channel about 1,600 feet long, 75 feet wide on the bottom and 12 feet deep at mean low water, were received on Oct. 26, 1905, and contract entered into Oct. 30, 1905, with the New England Dredging Company, the lowest bidder, the contract price being $23\frac{8}{10}$ cents per cubic yard, measured in scows. The amount of excavation is estimated to be about 35,500 cubic yards, *situ* measurement, the work to be completed by May 31, 1906.

The total amount expended on this improvement since the passage of the act of 1903 aforesaid, to Dec. 1, 1905, is \$26,359.19.

COMMONWEALTH FLATS AT SOUTH BOSTON.

The Commonwealth owns a large tract of filled land at South Boston, commonly known as the South Boston flats, shown on the plan accompanying the annual report of the Board for 1903, and located both northerly and southerly of Summer Street, easterly of the railroad terminal, and having a long frontage on Boston upper harbor and the reserved channel.

The area northerly of Summer Street is 4,317,234 square feet, or 99.1 acres exclusive of pile piers, but including the filled portion of the Commonwealth pier, 4,662,234 square feet, or 107.2 acres; of this area, 792,287 square feet, or 18.2 acres, is under lease. The area southerly of Summer Street, exclusive of streets, is 1,917,347 square feet, or 44 acres, of which 88,221 square feet, or 2 acres, is under lease, and 304,560 square feet, together with 47,000 square feet in two cross streets, or 8.1 acres in all, is used temporarily as a public playground, under authority of chapter 421 of the Acts of 1891.

The lease from the Commonwealth to Curran & Burton, dated June 15, 1900, of 267,320 square feet of land and two pile piers, northerly of Summer Street, has been renewed for a period of ten years from Oct. 1, 1905, in accordance with the option contained in the original lease.

No new sales or leases of these lands were made during the year.

The sewers, drains and streets have been maintained, and the filling of the various lots to the required grade has been carried on by free dumping of selected material suitable for making a hard and firm surface.

COMMONWEALTH PIER.

Under authority of chapter 513 of the Acts of 1897, the Commonwealth has built a pier on its property at South Boston, 1,200 feet long and 400 feet wide, with a dock on the westerly side 175 feet wide at the outer end, 200 feet at the inner end and 30 feet deep at mean low water. There is also a berth at the outer end of this pier, having the same

depth as the dock. The total cost of this pier to Dec. 1, 1905, is \$381,877.09, paid from an appropriation of \$400,000 made by the act of 1897 aforesaid.

The use of this pier has been limited thus far by reason of delay in constructing Northern Avenue and bridge, which eventually will bring it into direct communication with the city proper. As the construction of this bridge and avenue is now assured, it is expected that the Commonwealth will soon receive a return from its investment.

The sum of \$230 has been collected and paid into the treasury of the Commonwealth during the year for the use by vessels of the dock on the westerly side of the pier.

NORTHERN AVENUE AND BRIDGE.

Under the provisions of chapter 381 of the Acts of 1903, authorizing the laying out and construction of Northern Avenue and bridge across Fort Point Channel and the land of the New England Railroad Company, the Boston Wharf Company and of the Commonwealth at South Boston, the State is required to pay to the city of Boston from time to time, as the work progresses, upon the order of this Board, the sum of \$260,000.

General plans for this bridge, providing for two draw openings, each not less than 75 feet wide, were approved by the Board on July 18, 1904, and by the Secretary of War on April 11, 1905, after hearing before the United States engineer officer in charge of river and harbor work in this district, whereof a full statement appears in the report of the Board for 1904, pages 19-26. Detail plans of construction were approved by the Board on Aug. 25, 1905, and the city of Boston has entered into a contract for an abutment and piers, which requires the completion of that work by November, 1906. It is expected that the bridge will be fully completed in the year 1907, and with Northern Avenue will give direct access to the lands of the Commonwealth and to the Commonwealth pier.

THE COMMONWEALTH'S FLATS AT EAST BOSTON.

This tract of land and flats is located at and near Jeffries Point in East Boston, and was purchased and taken by the Commonwealth under authority of chapter 486 of the Acts of 1897, the appropriation therefor being \$100,000.

The question involving the title of the East Boston Company, the largest owner, to certain of these flats taken as aforesaid, is still pending in the Land Court, under the charge of the Attorney-General.

The total amount expended on account of this property to Dec. 1, 1905, is \$25,138.79.

FORT POINT CHANNEL.

The mid-channel originally had a depth of 16 feet at its mouth and an average of 12 feet thence to Federal Street bridge. The Congress in 1886 authorized dredging a channel 175 feet wide and 23 feet deep at mean low water, about 4,200 feet long, to a point near Federal Street bridge, at an estimated cost of \$100,000. But a small portion of this sum, however, has been expended, to wit, \$18,027, by reason of the obstruction presented by the old New England Railroad bridge. Although that obstruction was removed in 1898, no further sum has been expended in the furtherance of this project.

As a consequence, the channel has proved inadequate for steamships navigating that thoroughfare; and this Board has been called upon at various times to improve the channel by dredging, for the purpose of enabling vessels to approach the wharves to which they were destined.

The commerce which navigates this channel terminating in South Bay has increased until it is now claimed to be annually greater than that which enters the harbor of Portland.

Under these circumstances, this Board has seen fit to present the situation to the Federal government, and urge resumption of work in carrying out the original project. Meanwhile, the pressure for dredging in special localities has induced the Board, without waiting for the action of Con-

gress, to dredge an area of 96,000 square feet to the depth of 18 feet at mean low water above Congress Street bridge, whereby 14,204 cubic yards of material were removed under contract, at a cost of 29 cents per cubic yard, in August; and later, in November, to execute a contract for dredging another area between Mount Washington Avenue and Federal Street bridges, of 52,000 square feet, to a depth of 16 feet, for 29 cents per cubic yard.

These two improvements by the Commonwealth, though inadequate, will temporarily relieve the situation, and also more than compensate for any shoaling caused by dumping snow and ice. An examination made in June, upon complaint of shoaling in the channel, showed that a small proportion only was caused by the dirt mixed with snow and ice dumped during the winter, but that the greater elements were clay, coal and coal dust, cinders and ashes carelessly and unlawfully deposited, either deliberately or in process of doing other work.

The total amount expended during the year was \$4,263.96, paid from the income of the harbor compensation fund.

SOUTH BAY.

No substantial amount of work has been done under a contract entered into with the Roxbury Central Wharf Company, April 8, 1904, for dredging a channel across the southerly end of the bay, in extension of the channel dredged by the Commonwealth in 1902, about 375 feet long, 110 feet wide on the bottom and 12 feet deep at mean low water, and which calls for the expenditure of \$8,000; but it is anticipated that the work will be completed during the coming season.

The total amount expended from the "Improvement of South Bay in the city of Boston fund," created by chapter 278 of the Acts of 1898, to Dec. 1, 1905, is \$49,341.24. The balance in this fund Nov. 30, 1905, was \$10,096.26.

CHARLES RIVER.

In March complaint was received from the Boston & Maine Railroad that a ledge located on the edge of the channel of Charles River, about opposite the westerly end of the draw

pier on the upper side of its southern division passenger bridge, had become an obstruction to the safe passage of vessels, owing to the change made in the draw-way in its freight bridge which had been rebuilt in accordance with requirements of the Charles River basin act, chapter 465, Acts of 1903.

The most direct and natural line between the draw-ways of the two bridges now lies directly over the summit of the ledge. Also, owing to the change in the freight bridge, it has become necessary to dredge an entirely new channel to the berth at the coal pockets of the railroad company at the Cambridge shore between the two bridges. In order to reach this channel it is necessary to make a sharp turn around the ledge, and in this case also the most direct track for vessels would be directly over the location of the ledge.

For the purpose of determining the extent of the obstruction, a survey was made of the ledge during the month of April, and there was found a depth of only 8.3 feet of water over it at mean low tide. The removal of the ledge to the depth of 18 feet at mean low water, which would accommodate practically all the vessels likely to navigate the river, would require the excavation of 1,170 cubic yards of ledge, and in addition a small amount of sand and gravel.

Copies of the plan of the survey were sent to the Boston & Maine Railroad and the Charles River Basin Commission.

The cost of this survey, amounting to \$91.80, was paid from the appropriation for survey and improvement of harbors.

JEFFRIES POINT.

By chapter 463 of the Acts of 1905 the Board was directed to dredge a channel in the flats near Jeffries Point, contingent upon the performance of a condition by the owners of land adjacent. The contingency not having arisen, the dredging has not been done.

STONY BEACH, HULL.

By chapter 253 of the Acts of 1905 an appropriation of \$1,500 was made, to be used in addition to the unexpended balance of \$1,647.15 appropriated by chapter 483 of the Acts

of 1901, for extending and completing the sea wall at Stony Beach, in Hull. This wall was constructed to prevent the sea from breaking through the ridge of beach connecting Point Allerton with the village of Hull, and preventing the sea from cutting off access to the village from the neck of main land.

It was found upon examination that a short section of the westerly end of the wall built in 1901 had been undermined and broken off; and on Aug. 25, 1905, a contract was entered into with William L. Miller, the lowest bidder, to remove the broken end of the wall and build an extension about 300 feet long, with two spur jetties, each about 50 feet long, from the end of the wall built in 1901 to a connection with the stone riprap protecting the embankment of the New York, New Haven & Hartford Railroad built along the beach at this point. The contract price was \$8.23 per lineal foot of sea wall, and \$3.52 per lineal foot of spur jetty. This work was completed Oct. 18, 1905, at a cost of \$2,728.82.

The beach in front of the portion of the wall built in 1901 has been strengthened by the wash of sand and pebbles filling the old bays between the spur jetties for about one-half the length of the wall toward the easterly end. The new wall built this year extends 4 feet deeper than the portion of the old wall adjacent to it, and its westerly end is thoroughly protected by the riprap of the railroad, so that there is very little probability that it will ever be undermined or disturbed.

The total amount expended at Stony Beach, Hull, to Dec. 1, 1905, is \$10,662.93.

WEYMOUTH FORE RIVER AND TOWN RIVER.

By the river and harbor act of Congress, approved March 3, 1905, \$57,500 was appropriated for dredging Weymouth Fore River below Quincy Point, upon the condition that the Commonwealth or other parties should assume the maintenance of the improvements made in the river above Quincy Point and the improvement made in Town River, without further expense to the United States other than the sums already provided.

The Commonwealth, by chapter 103 of the Resolves of

1905, assumed the responsibility of complying with this condition. The work of improving the channel by the Federal authorities has been in progress during the latter part of the season.

The Congressional appropriations already available were sufficient to complete the projected improvement of Town River and the re-dredging of the portions previously dredged, so as to leave the whole project in satisfactory condition.

In Fore River the Federal funds available were only sufficient to complete the dredging in accordance with the existing project, and in addition to barely commence re-dredging the channel previously dredged, which had filled in.

The cost of completing the re-dredging, if required by the Secretary of War in order to make the improvement conform to the project as estimated by the United States Engineers, would be about \$16,653. Whenever a demand for deeper water in the upper reaches of the Fore River shall be made, the condition of the resolve would seem to require the Legislature to make an appropriation for the necessary dredging.

The lower reaches of Weymouth Fore River have been improved by the Commonwealth, as stated in the report of the Board for 1904, page 13, under an appropriation of \$25,000 made by chapter 440 of the Acts of 1903, the total expenditure therefor to Dec. 1, 1905, being \$10,235.87. No dredging has been done by the Commonwealth in Town River.

LAND FOR NAVAL MAGAZINE.

By chapter 446 of the Acts of 1905 the consent of the Commonwealth is granted for the acquisition, by purchase or condemnation, by the United States, of lands situated in the towns of Hingham and Weymouth, lying on both sides of and in the bed of Weymouth Back River, containing about 1,100 acres, to be described in a plan or plans to be approved by the Harbor and Land Commissioners, and to be used for the purposes of a naval magazine and for other purposes of national defence.

The approval of the Board was given on Sept. 25, 1905, and the plan entitled "Plan of lands at Hingham and Weymouth, Mass., to be acquired by the United States of America

as the Site for a Naval Magazine under Act of Congress approved March 3, 1903, Scale 1:2500 June 1905," is on file in the office of the Secretary of the Commonwealth.

HANGMAN'S ISLAND.

On Jan. 1, 1905, the Board leased to William J. Greenfield, one of the former lessees, Hangman's Island, in Boston harbor, for a term of three years from that date, the annual rental being \$50. It is well to have fishermen continue to occupy this island, as they have been helpful from time to time as life-savers.

REVERE BREAKWATER.

By chapter 108 of the Resolves of 1905 the Board was instructed to build a breakwater north of Cherry Island bar and east of Eliot Circle in the town of Revere, of such size and character as to provide a safe anchorage for yachts and to protect the shore property from damage by the sea.

After a number of inquiries and visits to the locality, and a conference with residents of Revere at the office in August, a survey was made of the locality. It was found that a breakwater extending north from what is known as Half Tide Rock, which is located just north of the bar and about half way between the shore and the outer end of the bar, which could be built for the appropriation, would afford but slight protection for an anchorage ground; and the area protected would not, in the opinion of the Board, be large enough to justify the construction of the breakwater, nor would the shore property receive much if any benefit, and might be injured.

Plans were then made for a breakwater which would afford protection over an anchorage area of 900 by 600 feet, having a depth of from 6 to 7 feet at mean low water, with incidental protection to shore property from damage by the sea. The cost of this was estimated to be not less than \$55,000. This estimated cost exceeded the appropriation by \$30,000. The resolve provides that any expense necessary for the complete construction of a breakwater after the expenditure of the money hereby appropriated shall be incurred and borne

by the town of Revere or the citizens thereof. A communication was addressed to the selectmen of the town, stating that so soon as the Board is informed that the town or its citizens appropriated and made available for use the additional sum of \$30,000, immediate action would be taken in furtherance of the project. No reply has been received to date.

Inasmuch as the Board felt unauthorized to expend any of the appropriation unless it was sure of being able to fulfill the intent of the Legislature to secure the completion of a project toward which it intended to apply only the sum of \$25,000, no obligation has yet been incurred.

SAUGUS RIVER.

By chapter 27 of the Resolves of 1905 the Board was directed to make a survey of Saugus River between the Salem turnpike and Broad Sound and report thereon, together with estimates of the cost of dredging a channel to such depth and width as the Board may deem advisable.

A survey was made in accordance with the provisions of the resolve, together with an estimate of the cost.

The field work was done between June 19 and August 21. A plane table survey was made of the shore lines and bridges on a scale of 1 to 2,000, and soundings taken covering the whole width of the river from Salem turnpike to the Point of Pines and out across the bay to the deep water of Broad Sound, covering a width of about half a mile. The river from the turnpike to the Boston & Maine Railroad bridge, a distance of about half a mile, has an average width of 600 to 700 feet between the banks; below, as far as its mouth at the Point of Pines, it averages nearly 1,200 feet between the banks. The low-water channel averages about 500 feet in width from Salem turnpike to its junction with Pines River, about midway between the Boston & Maine and the Boston, Revere Beach & Lynn Railroad bridges.

The channel depth in this section is a little over 4 feet at mean low water, except where it has been dredged to a greater depth. At the present time the dredged channel extends from the junction of Pines River to the works of the General Electric Company, and has a depth of about 10 feet at

mean low water. The berth at the Electric Company's wharf has a depth of about 14 feet at mean low water.

Below the junction with Pines River to a point about half a mile below the wharf at the Point of Pines the channel widens, varying from about 400 to 600 feet, with a depth of from 7 to 20 feet at mean low water. Below this point the channel extends through the open bay to the deep water of Broad Sound.

Two sections of this channel were dredged by the United States government to 8 feet at mean low water for a width of 150 feet. Both these sections have since shoaled, so that there is now but 6 feet at mean low water over the bar, which is a little more than a mile below the Point of Pines.

At a conference with the representatives of owners of property bordering on the river, it was stated by those representing the General Electric Company, who at the present time are practically the only parties having vessels coming up the river, that a depth of 12 feet at mean low water will accommodate all the vessels which would be likely to navigate the river, the principal business now being the transportation of coal.

In order to accomplish this result, two estimates have been prepared, one for a channel 12 feet deep all the way from Broad Sound to the Salem turnpike, and the other 15 feet deep from the open bay to the mouth of the river at the Point of Pines, and 12 feet deep the balance of the way, as it seemed that the channel through the open bay was much more liable to silt up and reduce the depth than a channel in the river itself. Also, the waves in the open bay would cause vessels to pitch at times to a greater or less extent, and in order to prevent the vessels touching bottom, more depth would be required than in the still waters of the river. The width of the channel in each estimate is the same, being 200 feet on the bottom from the Point of Pines to the sea, and flaring out to about 400 feet in the last 2,000 feet. From the Point of Pines to the new highway bridge at the mouth of the river the width gradually narrows from 200 to 100 feet at the bridge. Between the highway bridge and the Boston, Revere Beach & Lynn Railroad bridge the width is again reduced to

75 feet, as in this section vessels will be continually alongside the draw piers of the bridges. Above this railroad bridge it widens again to 100 feet, and continues at this width to the Salem turnpike.

The amount of material to be excavated under these two projects is as follows:—

	12 Feet (cu. yds.).	15 and 12 Feet (cu. yds.).
In the portion of the channel from the Point of Pines to Broad Sound,	180,000	360,000
Portion of channel above Point of Pines,	108,000	108,000
	<hr/> 288,000	<hr/> 468,000

The river is crossed by three bridges: two, the State highway or parkway bridge and the Boston, Revere Beach & Lynn Railroad bridge, being between the Point of Pines and the mouth of Pines River; and one, the Boston & Maine Railroad bridge, just above the mouth of Pines River.

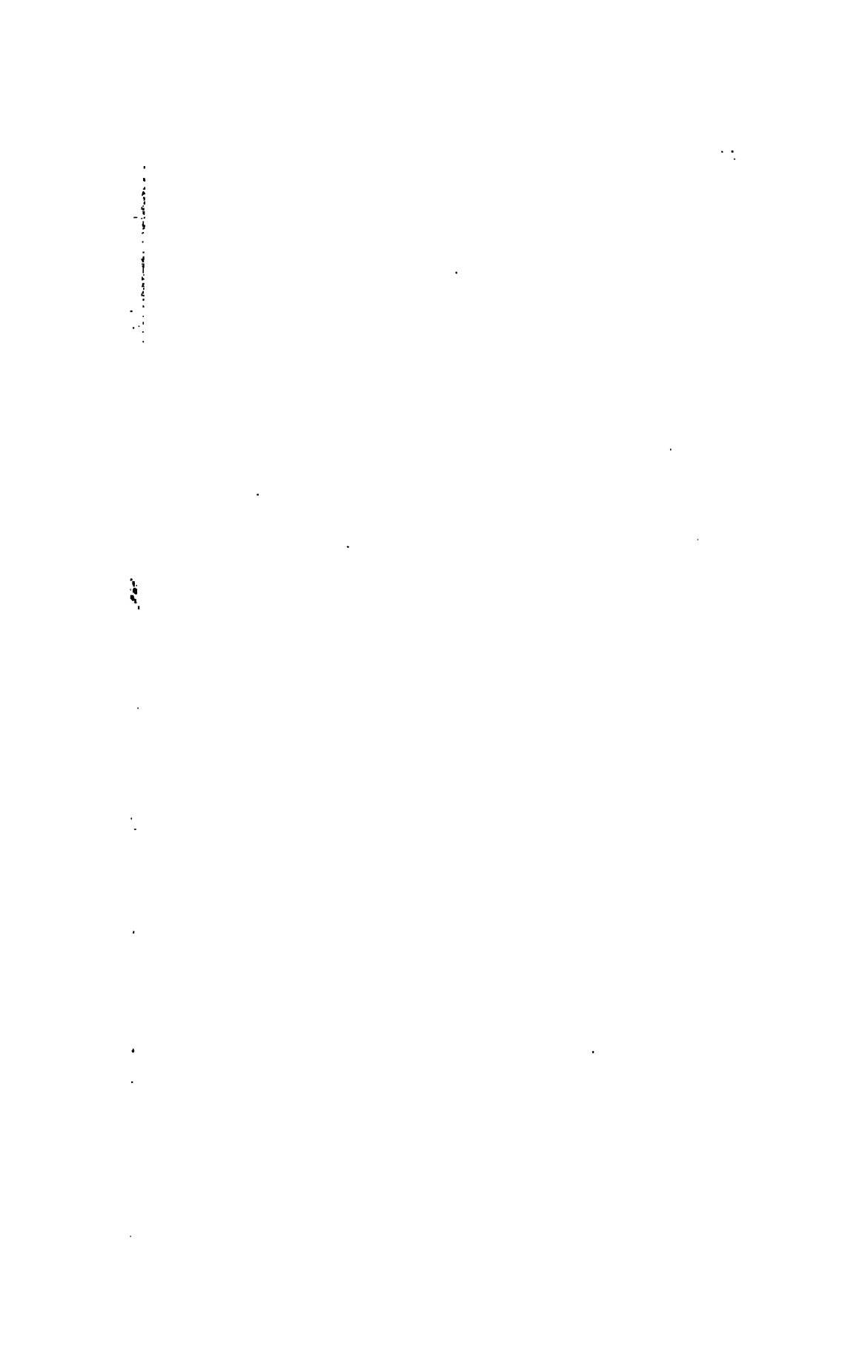
The highway bridge is a double-leaf Bascule draw, with a clear opening of 50 feet. The Boston, Revere Beach & Lynn Railroad bridge has a revolving turn-table draw, with a clear opening of 37 feet, which is probably wide enough for the present. The Boston & Maine Railroad bridge has a jack-knife draw, with a clear opening of 34 feet, which should be rebuilt when the channel is improved.

The estimated cost of excavating the channels is as follows:—

For channel 12 feet deep throughout its length:—	
288,000 cubic yards, at 25 cents,	\$72,000 00
Supervision and contingencies,	5,000 00
	<hr/> \$77,000 00
For channel 15 feet deep from Point of Pines to sea and 12 feet deep above:—	
468,000 cubic yards, at 25 cents,	\$117,000 00
Supervision and contingencies,	8,000 00
	<hr/> \$125,000 00

These estimates are based upon the scheme of excavating the material and towing it to sea.

The very considerable and growing commerce which would



navigate a channel enlarged in accordance with this project would seem to recommend it as being worthy of improvement by the Federal government.

Out of the appropriation of \$1,000 there has been expended to Dec. 1, 1905, \$638.53.

BASS RIVER, BEVERLY.

The dredging of the channel in Bass River at Beverly under chapter 341 of the Acts of 1903, which was commenced in 1904 under a contract with Charles H. Souther and John H. Gerrish, was completed Dec. 1, 1905. This channel is 6,600 feet long, 100 feet wide on the bottom, except through the ledge in the upper portion of the river, where the width is reduced to 75 feet, and 9 feet deep at mean low water, and enables vessels to reach the coal and lumber wharves in Beverly and the new wharf of the United Shoe Machinery Company.

The Commonwealth appropriated \$25,000 toward the cost of the work, which has been expended. The balance of cost, \$55,535.75, is the amount to be borne by the city of Beverly, of which there has been paid to Dec. 1, 1905, the sum of \$43,736.08.

The total cost of the work is as follows:—

Earth excavation,	\$67,041 54
Rock excavation,	10,989 60
Surveys and incidental expenses, including \$539.81 paid for preliminary survey from appropriation for survey and improvement of harbors,	3,044 42
Total,	<u>\$81,075 56</u>

Of this amount there has been expended to Dec. 1, 1905, \$69,275.89.

DANVERS RIVER.

On June 1, 1905, a petition was received from the county commissioners of Essex County for the approval of plans and specifications for a bridge and approaches across Danvers River, between Salem and Beverly, as authorized by chapter 371 of the Acts of 1903.

The provisions in section 3 of the act, that "no money

shall be expended until the plans and specifications for the bridge and its approaches have been approved by the board of harbor and land commissioners," required of the Board something more than the approval of plans; so that after a public hearing, at which was developed wide and earnest concern as to the location and the approaches, a personal examination was made of the locality and surroundings. At a later date, to wit, Oct. 30, 1905, the county commissioners presented modified plans, containing a change in location of bridge and approaches, which were, on Nov. 24, 1905, approved. The draw will have a clear opening of 50 feet.

ANNISQUAM RIVER.

Chapter 88 of the Resolves of 1904 authorized the excavation of a channel in the upper portion of Annisquam River, 50 feet wide and 6 feet deep at mean low water, from Wolf Hill to Gloucester harbor, according to a plan made by the Board under the provisions of chapter 71 of the Resolves of 1903, at an expense of not more than \$50,000, of which sum not more than \$17,000 shall be expended in any one year. To carry out this project, releases have been secured from all but one of the abutting property owners, and the Boston & Maine Railroad has signified its willingness to make the necessary changes in its bridge.

The plans and specifications for the new bridge at Western Avenue, to be built by the county commissioners of Essex County over the "canal" at the southerly end of the proposed channel, under authority of chapter 254 of the Acts of 1905, were finally approved, in conference with the county commissioners, on Nov. 20, 1905.

Upon information that the city of Gloucester is preparing to acquire for park purposes the eastern bank of the canal which forms a portion of the proposed channel, including as part of the taking the area whose owner has not given a release to the Commonwealth, the Board is awaiting the result.

Presumably all necessary action may be taken during the winter, so that the work on the channel may commence early in the spring.

The total amount expended on this project to Dec. 1, 1905, is \$1,399.28.

CONNECTICUT RIVER.

By chapter 344 of the Acts of 1885 this Board was given the general care and supervision of the Connecticut River and its banks and of all structures therein, to prevent and remove unauthorized encroachments and causes of every kind which may in any way injure the river, and to protect and develop the rights and property of the public therein.

Hatfield. — The dikes constructed in 1904 on the banks of the Connecticut River in the town of Hatfield under chapter 82 of the Resolves of 1903 are efficient, and prevent the river at high water from flowing across the meadows, where it was feared it might cut through and make a new channel.

During the summer, in order to prevent the river at times of high water from flowing in upon the upper side of the dikes built in 1904, where it was liable to create eddies and do damage, a dike with culvert and swinging gate was built across the mouth of the ditch or drain just north of the dikes previously built. As this dike was to be 12 feet high, and would have to withstand the pressure of water nearly its full height, it was constructed with a core of cement concrete. The outer or river face of the dike was protected by stone riprap, and the bottom and sides of the ditch at each end of the culvert through the dike were protected by stone paving grouted with cement mortar.

The work was done under contract with Daniel O'Connell's Sons of Holyoke, the lowest bidders. The money was available from the balance of the appropriation of \$7,500 made in 1903, of which the sum of \$2,389.76 remained unexpended. A petition of the inhabitants of the town, requesting that the dike should be built, was filed with the Board. The total cost of the work, including surveys and supervision, was \$1,590.51. These dikes have been transferred to the town of Hatfield for care and maintenance.

The total amount expended at Hatfield to Dec. 1, 1905, is \$6,700.75.

Hadley. — In the early summer, at the request of the selectmen of Hadley, an examination was made of the riprapping of the river bank on the upper side of the village of Hadley. A portion of the bank which was riprapped in 1888-1889 was graded quite steep, and along the summer water line the brush rotted out and the water undermined the stone, which in places had slipped down, thus removing the protection to portions of the bank.

Some of the riprap was replaced in 1904 and the gaps filled in, thus affording an efficient protection. This summer additional places were found to have caved in, but not to such an extent as to require immediate attention, and it seemed best to let the bank remain another year before undertaking further repairs. It will probably be necessary to do additional work on this section the coming year.

The total amount expended at Hadley to Dec. 1, 1905, is \$60,864.41.

West Springfield. — In West Springfield, at Riverdale, the river has been for some time undermining and wearing away a portion of the natural bank. A shore owner had heretofore riprapped about 50 feet at considerable expense. There was danger of a continuance of the injury. A chance for securing a large amount of stone suitable for riprapping at a very low cost presented itself, and the Board, in co-operation with the shore owner, took advantage of the opportunity. The work was done under the supervision of the engineer and to the satisfaction of the Board, and will probably save a much larger expenditure.

About 250 lineal feet of the river bank were thus protected, extending from above the highest flood level to below the low-water level of the river. The total cost of this work to the Commonwealth was \$135.

The total amount expended at West Springfield to Dec. 1, 1905, is \$5,051.49.

Agawam. — The willows along the bank of the river in the town of Agawam have grown up so that they have begun to obstruct the view of the river from the highway and are complained of as breeding mosquitoes. It seemed to the Board, however, that these willows had not at the present

time grown sufficiently to need cutting, and that they would more effectually prevent the washing of the bank if allowed to grow a year or two longer.

The total amount expended in protecting the river bank at Agawam to Dec. 1, 1905, is \$8,005.76.

The total amount expended to Dec. 1, 1905, in protecting the Connecticut River banks in Hatfield, Hadley, West Springfield and Agawam, is \$60,622.41.

Under the authority given the Board by chapter 58 of the Resolves of 1902, four of the scows used in riprapping the river bank were sold to the Boston & Maine Railroad for the sum of \$189, which was paid into the treasury. Two of the scows still remain stored at Hadley. They were used in 1904 for repairing the riprap work, and will probably be required for similar work in the future.

GREEN HARBOR.

By chapter 393 of the Acts of 1904 an appropriation of \$10,000 was made for dredging at Green Harbor in the town of Marshfield. There has been no expenditure from this appropriation, as the Board is still of the opinion expressed in its report for 1904, page 33, that it is inadvisable to contract for the dredging until both jetties have been built up, and under the terms of the act it does not feel authorized to spend any of the appropriation to rebuild or repair the jetties. It is estimated that a proper building up of the jetties would cost not less than \$15,000.

The total amount expended for the construction of stone jetties, for dredging, etc., to improve this harbor since beginning work in 1898, to Dec. 1, 1905, is \$65,961.42.

SCITUATE.

As appears in the report of the Board for 1902, out of the appropriation of \$15,000 for protecting the shores and harbor of the town of Scituate, the sum of \$12,189.03 was expended in building 2,448 feet of sea wall.

In December, 1904, John B. Damon made a claim for damages to his property by building the wall on the crest of the beach lying between Damons Island and The Glades at

North Scituate. The Board, believing that his property had received a substantial benefit by the building of the wall, declined to award damages. A suit was brought, and he recovered a verdict of \$3,833.83 from a Plymouth County jury. Subsequently a settlement was made through the office of the Attorney-General by the payment of \$2,000 in full satisfaction.

STAGE HARBOR, CHATHAM.

By chapter 47 of the Resolves of 1903 the Board was authorized to build a timber dike and structures to close the breach at the eastern end of Stage harbor in Chatham, to protect the harbor from encroachments or damage by the sea, and an appropriation of \$5,000 was made therefor.

By chapter 90 of the Resolves of 1904 \$1,000 additional was appropriated, the first appropriation having been found insufficient for doing the work.

In 1904, owing to changes which had occurred in the outer beach, and at the request of inhabitants of the town, the Board decided to delay the construction of the dike.

In the spring of 1905, the outer beach at Chatham meanwhile having been broken through by the sea at a point nearly opposite the passage into Stage harbor, it was decided that the structures were absolutely required; and on June 27 a contract was entered into with Joseph J. Callahan, the lowest bidder, to build them as originally designed.

After the work was commenced it was found that the changes which had been and were taking place were of such a nature that it was necessary to extend the dike further across the marsh. Later, during the construction of the dike across the main portion of the passage, so much sand was washed out by the current that in order to protect the timber from the worms it was found necessary to bank the timber work with sand up to the low-water level. The rapid changes in the sand caused by the action of the sea through the break in the outer beach necessitated additional construction, in order to preserve the harbor and render effective the original
ject.

unforeseeable additional work made the total cost ex-

ceed the amount of the appropriation by \$1,475.37, which will be paid from the appropriation for the survey and improvement of harbors. All of the work at this harbor has been completed at a total cost of \$7,475.37, of which there has been paid to Dec. 1, 1905, the sum of \$6,051.13.

LEWIS BAY.

In 1899 surveys and examinations were made of Lewis Bay in the towns of Barnstable and Yarmouth, also estimates of the cost of improving the channels leading from Hyannis harbor into the bay and up to the landing at the Hyannis Yacht Club house. By chapter 194 of the Acts of 1900 an appropriation of \$12,500 was made for dredging a channel 6 feet deep at mean low water through the bay to the yacht club landing. This channel was excavated during that year, and by chapter 395 of the Acts of 1905 an appropriation of \$3,000 was made for dredging a channel across the bar in the eastern end of the bay.

This latter work was advertised in connection with the project for the improvement of Witchmere harbor and Paskamansett River; and on Aug. 2, 1905, a contract was entered into with the Bay State Dredging Company for excavating the channel, the contract price being 40 cents per cubic yard, the total amount to be paid not to exceed \$3,000.

As the work progressed it was found that, owing to unauthorized changes in the United States bench marks, with reference to which surveys for estimates were made, the amount of material to be excavated largely exceeded the original estimates; and, in order to dredge the channel as required, it became necessary to excavate the additional amount of about 2,000 cubic yards, at an extra cost of \$650.

The cost of this work when completed will be as follows:—

Excavation done by the dredging company,	. . .	\$3,650 00
Surveys and superintendence,	. . .	90 94
Total,	. . .	\$3,740 94

The total amount expended for the improvement of Lewis Bay to Dec. 1, 1905, is \$13,319.72.

HERRING RIVER.

By chapter 399 of the Acts of 1905 the Board was authorized to dredge the mouth of Herring River in the town of Harwich, to protect the same by jetties and otherwise improve the entrance.

An appropriation of \$10,000 was made for carrying out the provisions of this act, it being provided that before the work was commenced the sum of \$2,000 should be deposited with the Treasurer of the Commonwealth by the town of Harwich or its citizens, to be expended by the Board in addition to the \$10,000 appropriated as aforesaid.

On June 16, 1905, the sum of \$2,000 was deposited.

An examination was made of the mouth of the river in 1901, under the provisions of chapter 66 of the Resolves of that year, also a report and estimate of the cost of improving the same by dredging a new outlet 3 feet deep at mean low water, and protecting the same by stone jetties extending out to deep water in Nantucket Sound. The cost of this improvement was estimated from \$35,300 to \$59,100, the lower price being for timber jetties and the larger for stone jetties.

The appropriation made in 1905 being inadequate for carrying out the project as outlined, a survey was made to determine the changes which had taken place since the survey of 1901. It developed that the outlet had moved about 400 feet easterly, and that the entrance channel was much more difficult to navigate than in 1901. There had been no material change in the portion of the beach where it was proposed to create the new entrance in 1901, and plans were made for the construction of two stone jetties much shorter than those originally designed; for the excavation of a new channel through the beach, 75 feet wide on the bottom, to the level of mean low water; for riprapping its banks with stone; and for constructing an embankment or dike across the old outlet, so that the river would be turned into the new outlet through which it should scour a straight channel at least as large as the existing one.

The work, so far as planned, is of a permanent nature, and prevent the mouth of the river from shifting in the

future, and the jetties will prevent the waves from driving the sand into the mouth of the river. It will also enable the full force of the current to be utilized in enlarging and deepening the channel.

On July 27, 1905, a contract was entered into with Thomas & Connor, the lowest bidders, for building the jetties and excavating the channel, the contract price being \$2.33 per ton for stone placed in the jetties and riprap, and \$840 for the excavation of the channel through the beach to low-water mark. This work is now completed.

During the summer the old channel shifted quite materially, cutting into the beach on the easterly side of the entrance and also the high bluff further east. This created a low spot in the beach, over which the tide flowed at high water. In order to close this and turn the full volume of the tide through the new entrance, a low sand dike was built across this low spot, at an extra expense of \$40. It is too early as yet to express an opinion as to how large an entrance channel will be created by the improvement, but the Board is satisfied that the availability of the river as a harbor for small boats will be materially enhanced.

The cost of work done during the year is as follows:—

For work under contract,	\$11,141 02
For surveys, supervision and incidental expenses, . . .	687 42
Total,	<hr/> \$11,778 44

The total amount expended at Herring River to Dec. 1, 1905, is \$10,297.27.

WITCHMERE HARBOR.

This harbor, located at Harwichport, was improved by the construction of jetties under authority of chapter 463 of the Acts of 1899, the total amount expended by the Commonwealth to Dec. 1, 1904, being \$4,975.46.

By chapter 91 of the Resolves of 1904 the sum of \$3,500 was appropriated for improving Witchmere harbor, by dredging the channel and in such other manner as may be deemed best; provided, however, that the town of Harwich or the

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citizens thereof should deposit not less than \$500 with the Treasurer of the Commonwealth to complete the same.

A survey was made in June, 1904, and it was estimated that the cost of excavating the channel would be not less than \$4,000. On Sept. 1, 1904, the Board was informed by the State Treasurer that \$500 had been deposited with him by the town of Harwich under the above resolve.

The Board endeavored to make a contract for excavating the channel, but was unable to do so until it advertised the work in connection with the improvements at Lewis Bay and Paskamansett River, authorized by the Legislature of 1905. On Aug. 2, 1905, a contract was entered into with the Bay State Dredging Company for dredging the entrance channel to this harbor, 40 feet wide, 5 feet deep at mean low water and about 1,150 feet long, for the sum of \$3,825, the estimated amount of material to be excavated, *situ* measurement, being 10,000 cubic yards. This work was completed in a satisfactory manner, and in addition thereto the shoal within the harbor easterly of the westerly side line of the channel was also removed at an expense of \$950, of which the Commonwealth paid \$175 and the town the balance.

As sand was washing through between the large stones of the jetty on the westerly side of the entrance into the channel, arrangements were made for closing these interstices with concrete. Owing to the lateness of the season, this work could not be completed; but enough was done to close the openings through the lower portion of the jetty, through which the larger part of the sand was driven.

After the stone jetty was extended 150 feet in 1899, the beach to the westward built out to such an extent that large quantities of sea weed and some sand are constantly washing around the end of it into the channel. To prevent the continuance of this action, which will result in filling up and decreasing the depth of water in the channel, the stone jetty should be extended about 300 feet, substantially in the line of the portion built in 1899.

The cost of such an extension is estimated to be about \$10,000.

The cost of the work done during the year paid for by the Commonwealth is as follows:—

Excavating channel under contract,	\$3,825 00
Extra dredging of shoal in harbor,	175 00
Work on stone jetty, and for advertising,	729 19
<hr/>	
Total,	\$4,729 19

The total amount expended for the improvement of this harbor to Dec. 1, 1905, is \$8,823.96.

BASS RIVER, YARMOUTH.

In April a survey was made of the mouth of Bass River at Yarmouth. While considerable change had been made by the current during the past year, in general the depth and width of the channel had increased, so that the facilities for navigation were improved.

Owing to the scour of the current and the settling of the sand-bag embankment along the sides of the outer portion of the eastern jetty, that section of the jetty seemed to require a more substantial protection. On Dec. 1, 1904, a contract was made with Charles A. & Joseph J. Callahan to protect about 1,000 feet of the outer end with stone riprap. This work was completed Aug. 4, 1905, material to the amount of 1,838 tons having been deposited in place. The jetty is now protected in a thoroughly substantial manner from a level just above low-water mark to the bottom of the channel.

In addition to this work, about 50 tons of stone were placed at the inner end of the western jetty, to prevent the cutting away of the shore at the meeting point.

The cost of work done during the year is as follows:—

Stone riprap in eastern jetty,	\$4,578 98
Riprap inner end of western jetty,	132 50
Supervision and incidental work,	373 07
<hr/>	
Total,	\$5,084 55

Of this amount, \$5,034.62 was paid from the appropriation of \$15,000 made by chapter 46 of the Resolves of 1903, and

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\$49.93 from the appropriation for the survey and improvement of harbors.

The total amount expended in improving the entrance to this river to Dec. 1, 1905, is \$37,129.68.

EAST BAY, OSTERVILLE.

Under authority of chapter 370 of the Acts of 1903 a channel was excavated through the beach from East Bay, located at Osterville in the town of Barnstable, to Nantucket Sound, two stone jetties built, the banks of the cut through the beach riprapped with stone, and the old outlet of the bay to the sound closed by a temporary dam, all at a total cost to Dec. 1, 1904, of \$6,618.10.

The new channel opened in the spring of 1904 and the jetties protecting it are in good condition. A survey was made early in May and the depth on the bar was found to be nearly 3 feet at mean low tide. The sea had cut into the shore to the east of the easterly jetty to a dangerous extent, and was liable to break through the narrow beach. To meet the situation it is proposed to riprap this weak strip of the beach, about 150 feet, with stone taken from the outer end of the easterly jetty, at a cost of \$250.

The flow of water through the old outlet, which broke down the temporary sand-bag dam built across it, has prevented the sea from closing up that mouth. But in order to close it in a substantial manner, so that all the current will flow through the new outlet, the Bay State Dredging Company is to build a sand embankment across it, for the sum of \$600. The presence of a dredging machine in the vicinity enabled the Board to effect this arrangement at a low figure. This work will be done during the month of December, 1905.

No material change has taken place inside the bay, and the depth of water between the main portion thereof and the approach to the outlet is much less than in the outlet itself. It has, however, since construction saved many boats from shipwreck during several severe gales.

The total amount expended at East Bay to Dec. 1, 1905, is \$6,649.52.

WEST BAY, OSTERVILLE.

A survey was made of the channel through West Bay at Osterville during the spring, and it was found to be in good condition. The bar just inside the inner end of the jetties had been washed away to a considerable extent. There was a good depth of water in the channel on the easterly side of the bar and a fairly good depth on the westerly side.

It was stated that the westerly channel had been used quite extensively during the summer, and that, on the whole, the bar had offered but little obstruction to the use of the entrance.

Some of the planks in the jetties had become loosened, and were replaced and secured at an expense of \$60.55.

The total amount expended at West Bay to Dec. 1, 1905, is \$29,285.64.

NEW BEDFORD HARBOR LINE.

On Oct. 5, 1905, a petition was received from the Union Street Railway Company and the City Coal Company of New Bedford, asking the Board to take such action as will result in changing the harbor line in front of their wharves in New Bedford harbor, near the New Bedford and Fairhaven bridge.

Under the provisions of chapter 96 of the Revised Laws, section 14, the petitioners were ordered to publish notice of this application; and on Nov. 8, 1905, after due publication, a hearing was given, at which all parties interested had an opportunity to be heard. No one appeared in opposition.

The reasons advanced by the petitioners for the change in the present harbor line, which was established by chapter 269 of the Acts of 1848, were that the condition of the sea wall and foundation on the property of the street railway company requires that the same be rebuilt; that, owing to the deepening of the channel and berth in front of their wharves, and other changed conditions due to the construction of the Fairhaven bridge and other causes, it has become necessary to reconstruct the walls at the outer end of their wharves;

that, owing to the narrow space between the outer ends of their wharves and the easterly ends of the large brick power houses on the wharf of the street railway company, it is practically impossible to reconstruct the walls within the existing harbor line; that, in order to make the necessary repairs without damage to their structures, the harbor line should be advanced from 8 to 10 feet.

From an examination of the locality it appears that formerly the main navigable channel of this portion of the harbor lay immediately in front of these wharves and between them and Fish Island, and over this channel the draw in the Fairhaven bridge was located. The space between the ends of the wharves and the island was too narrow to enable vessels to lie at the end of the wharves and leave a sufficient channel for navigation; consequently, it was decided at the time the bridge was rebuilt to place the draw eastward of Fish Island, a new navigable channel being dredged to conform to the new location of the draw. That portion of the bridge across the old channel having been built without a draw, the space in front of these wharves is now in the nature of a dock, there being no opportunity for vessels to pass up beyond these wharves.

The Board is of the opinion that there is sufficient reason for permitting the desired change in the harbor line, and that it will not interfere with public navigation.

While investigating this subject it was found that the harbor line immediately above the bridge might also be advanced, to conform to changed conditions and in substantial coincidence with the United States harbor line. The Board therefore reports this matter to the Legislature for action.

PASKAMANSETT RIVER.

By chapter 449 of the Acts of 1905 the Board was authorized to expend a sum not exceeding \$2,000 in deepening and improving the entrance to Paskamansett River in the town of Dartmouth. A survey was made in June, 1905, and an examination of the locality made by the Board in July.

This river empties into a cove on the westerly side of Buz-

zards Bay, between Mishaum Point and Barneys Joy Point. It has a channel 5 to 10 feet deep at mean low water, but its mouth is obstructed by a bar over which there is less than 3 feet at low tide. The beach to the southwest of the entrance is gradually working into the channel, and if a permanent improvement is to be created, a jetty should be built extending from this point in a southerly direction parallel with the general direction of the river channel.

The amount of the appropriation would not warrant the construction of such a jetty, but the dredging of a channel through the bar would give the immediate benefit desired. Consequently, it was decided to dredge across the bar in order to give passage between the bay and the deep channel in the river.

On Aug. 2, 1905, a contract was entered into with the Bay State Dredging Company to dredge a channel 150 feet wide, 5 feet deep at mean low water and about 400 feet long, through the bar at the mouth of the river, the contract price being 48 cents per cubic yard, with the provision that the cost of the whole work should not exceed \$2,000, the amount of the appropriation. Presumably this work will be done during the month of December.

The total amount expended in connection with this improvement to Dec. 1, 1905, is \$92.15.

NASHAWENA ISLAND.

At the request of the Governor and Council a survey and examination of the harbor at the island of Nashawena were undertaken, and a plan and estimate made of the cost of improving it sufficiently to make a safe and practicable landing for vessels, such as would be required in connection with the use of the island as a prison site.

The natural harbor runs nearly east and west, with an entrance into Buzzards Bay towards the north, and it is entirely feasible to dredge a channel at the mouth and an inside area of ample capacity to a depth of 12 feet at mean low water.

The approach to the harbor is deep, the water shoaling

quite rapidly at the entrance. The present wharf appears to be located in a favorable place, and will be made accessible by the excavation of a channel 12 feet deep at mean low water, 150 feet wide and about 1,500 feet long; opposite the wharf the channel may be widened to 200 feet.

To more fully protect this basin a breakwater or jetty should be built, extending out from the headland on the eastern side of the harbor over the shoal or bar for a distance of about 750 feet. The bar at the present time is so high as to afford fairly good protection, but that can be materially increased by the construction of a breakwater.

There is ample stone on the island in the vicinity of the harbor to construct this breakwater, and it is work admirably adapted to furnish occupation to a large number of men with a minimum use of machinery.

The outer portion of the channel is through a bed of gravel and stone, which, once excavated, will probably be very little affected by the action of the waves; while the inner portion of the channel, where there is a large amount of soft material, will be so protected by the bar and breakwater that the waves will not injure it.

This channel will give free access to the most convenient landing place on the island, and will require the excavation, including side slopes on angles of 1 on 2, of 64,400 cubic yards. Its cost is estimated as follows:—

64,400 cubic yards, at 40 cents,	\$25,760 00
Surveys and supervision,	1,000 00
Total,	\$26,760 00

The present wharf should be extended to the edge of the proposed channel, and enlarged. This extension, if constructed of masonry, could also be done by hand labor.

For preliminary temporary use a small pile structure can be built at the end of the present wharf, at an expense not exceeding \$500, including the repair of the top of the existing wharf. The construction of the breakwater and of the permanent wharf can be delayed for a time, and if the island is to be used as a prison site, they can be easily constructed by

the labor of the convicts; and for this reason no estimate of their cost has been made.

Plans and estimates of the proposed harbor improvement were prepared and sent to the Governor on Nov. 1, 1905.

CUTTYHUNK.

Under chapter 33 of the Resolves of 1900 the Board made surveys and estimates for improving the harbor of Cuttyhunk in the town of Gosnold. Three plans for the improvement of the harbor were made, one for improving the existing entrance channel by building jetties and dredging, and the other two for building jetties and cutting new entrances into Cuttyhunk Pond through the beaches at the north and east sides of the pond. The estimated cost varied from \$29,550 to \$116,500.

By chapter 450 of the Acts of 1905 an appropriation of \$5,000 was made for dredging and otherwise improving the harbor. The appropriation being too small to fully carry out either of the schemes reported in 1900, a survey was made of the existing entrance, and a plan prepared for building two stone jetties, one on either side of the entrance, to direct and confine the current over the bar and prevent the waves from driving sand and shingle into the narrow channel opposite the point of the north beach. Both jetties are to start from the crest of the beach, and at that elevation to extend a short distance, the balance and outer portion of each jetty to extend only to the level of high water, with a mound at the end, rising about 4 feet above ordinary high water, for the purpose of marking the entrance.

It was estimated that jetties of this description could be built within the appropriation. Stone of a class suitable for this work is very abundant on the island and along the shores of the pond, from which it can readily be taken and used for the construction of the jetty. Most of the stone is owned by the Cuttyhunk Club, and on September 4 the assent of the club was obtained for the Commonwealth to take the stone and use it for the construction of the jetty, thereby enabling the Board to use the appropriation to the best advantage.

Proposals were invited, and on Sept. 28, 1905, a contract

was entered into with Joseph J. Callahan, the lowest bidder, to build the jetties, the contract price being \$1.08 per ton of 2,000 pounds, the work to be completed June 1, 1906. Owing to the late date at which the contract was made, and to the fact that the contractor was already engaged in building a timber dike for the Commonwealth at Stage harbor in Chatham, it was decided not to begin work at Cuttyhunk until spring, which would leave ample time to do the work within the contract limit. During the winter the contractor will build the scows and plant necessary for vigorously prosecuting the work in the spring.

The total amount expended in connection with this harbor to Dec. 1, 1905, is \$458.88.

VINEYARD HAVEN HARBOR.

Under authority of chapter 95 of the Resolves of 1904 the Board last year reported on plans for the improvement of Vineyard Haven harbor, to provide safe anchorage ground for small yachts and boats. By chapter 442 of the Acts of 1905 the Board was directed to construct a stone breakwater on the westerly side of the harbor north of the steamboat wharf, within the appropriation of \$10,000, which is about one-half the estimated cost of a breakwater 1,200 feet long.

In order to obtain the greatest protection with an expenditure limited to the amount of the appropriation, plans were prepared for a breakwater about 700 feet long in the shoalest part of the location recommended in the report of the previous year; and on Sept. 8, 1905, a contract was entered into with E. S. Belden & Sons for its construction, the contract price being \$1.40 per ton of 2,000 pounds. The breakwater is to be located on the shoal ground on the westerly side of the harbor, about opposite Arnoux's wharf. It is to be between 600 and 700 feet long, 5 feet wide on top, and to project about 2 feet above ordinary high water, the outer face sloping on an angle of 1 on 1½, the slope of the inner face to be steeper. The anchorage basin will vary in depth from 4 to 8 feet at mean low water.

Owing to other work the contractor had on hand, construction will be delayed until spring, but it is to be wholly

completed on or before June 1, 1906, the date named in the contract.

The total amount expended in connection with this harbor to Dec. 1, 1905, is \$253.80.

LAKE ANTHONY, COTTAGE CITY.

No work has been done at this harbor except the completion of the dredging which was in progress at the end of last year under the provisions of chapter 416 of the Acts of 1904. The jetties require some repairs, which will be made the coming spring by filling in spaces between the large stones with cement concrete, to prevent the sand from washing through them and shoaling the channel. This work has to be done from time to time, as new openings are caused by the settlement of the stones forming the jetties. The total expense of the dredging for the year was \$5,654.87.

The mooring buoys set by the Commonwealth are in good condition, having been taken up and painted by the harbor master during the spring.

The use of the harbor is growing yearly as a place of refuge and for anchorage, and the area increased by the last dredging accommodates a large number of yachtsmen, sailing parties and fishermen.

The total amount expended at Lake Anthony to Dec. 1, 1905, is \$36,172.95.

NANTUCKET HARBOR.

By chapter 451 of the Acts of 1905 the Board was authorized to improve the harbor of Nantucket by dredging in the channel between Brant Point and Hussey shoal, \$5,000 being appropriated for the purpose.

Early in July, 1905, an examination was made by the Board, and later a survey was made of the northerly end of Hussey shoal and the channel between it and Brant Point. A plan was adopted for dredging the northerly end of the shoal so as to increase the width of the channel where vessels entering the harbor were likely to be carried into shoal water by the strong tide, especially when missing stays in beating against a head wind.

On Aug. 25, 1905, a contract was entered into with the Morris & Cumings Dredging Company, the lowest bidder, to dredge an area from the northwest end of the shoal about 400 feet long and 300 feet wide, to the depth of 12 feet at mean low water, for the sum of 28 cents per cubic yard. This work was completed Oct. 18, 1905, and in addition a small amount of material was excavated from the easterly side of the channel opposite Brant Point. The improvement of this channel is a great benefit to the harbor.

In all 16,732 cubic yards of material were removed, the cost of the same being as follows:—

Contract work,	\$4,684 96
Surveys and incidental work,	163 89
Total,	<u>\$4,848 85</u>

The total amount expended for the improvement of this harbor to Dec. 1, 1905, is \$5,226.11.

WRECKS AND OBSTRUCTIONS.

Complaints regarding wrecks have been received by the Board, and action thereon taken, with results as follows:—

Wreck of schooner "Albert Harding" at the entrance to Pigeon Cove harbor in Rockport. Removed by the United States government.

Schooner "Chromo" wrecked at the entrance to Boston harbor, off Boston light. Removed by the United States government.

Sloop yacht "Gooshkeen" in Pleasure Bay at City Point, South Boston. Removed by the owner.

Wreck of schooner "Annie E. Lane" in Beverly harbor, near the draw of the Salem-Beverly bridge. Removed by the Board and sold to William M. Swasey of Salem. The net cost to the Commonwealth will be \$225.

House boat "Charles McDonald" in Beverly harbor. Removed by the owner.

Wreck of small schooner in the channel of Quisset harbor in Falmouth. Removed by the Board at an expense of \$25.

The total amount expended from the appropriation of \$1,000 made by chapter 38 of the Acts of 1905, to Dec. 1, 1905, is \$25.

FALL RIVER—SOMERSET BRIDGE.

The Railroad Commissioners, the Harbor and Land Commissioners and the County Commissioners of the county of Bristol were constituted a Joint Board by chapter 462 of the Acts of 1903, and directed to locate and construct a new drawbridge over Taunton Great River, between the city of Fall River and the town of Somerset, with the necessary approaches and ways thereto, at a cost not to exceed \$1,000,000.

As stated in the report for 1904, page 76, plans for a bridge with a lift draw, having a clear passageway of 70 feet, to be located about 1,200 feet north of the existing Slades Ferry bridge, with the easterly terminus at Brightman Street in Fall River, were approved by this Board on May 2, 1904, and application made by the Joint Board to the Secretary of War for his approval of these plans.

A favorable report on the plans presented was made by the United States engineer officer in charge of the district where the bridge is to be built; but before final action upon the matter, at the instance of certain remonstrants, a special Board of three engineer officers was appointed by the Secretary of War to further investigate and report upon this project. They gave a public hearing in Fall River on April 14, 1905, at which members of the Joint Board and others, in favor, as well as those in opposition to the original plans submitted, were heard at length.

The report of this special Board was unfavorable, and notice was subsequently received from the acting Secretary of War that these plans failed to meet with approval.

A request will be made for a further hearing before the Secretary of War, asking for reconsideration of the subject, the Joint Board being unanimously of the opinion that the original site selected is the one where the bridge should be built, for the reasons following, to wit: that it will cost less; that it will afford the greatest convenience to the largest number of the public travelling on the highway and prevent the least obstruction to navigation, at the same time avoiding any curtailment of the harbor or interfering with

the use of shore front adapted for wharves and docks. By this is meant that, balancing the several conveniences of the public travelling by land and the public using the water way, the site selected would be the least objectionable. If located above, its usefulness would be greatly impaired; if below, it would cost more and interfere with future water front development. The chief objection urged seems to be its inconvenience, or, as the remonstrants say, its danger to tows. This can be wholly obviated by limiting the tows to three vessels, and shortening up the tow lines.

GREAT PONDS.

By chapter 318 of the Acts of 1888 the Board was given jurisdiction over great ponds containing in their natural state more than 10 acres of land.

Numerous licenses have been granted from time to time, since the passage of this act, for the erection of structures and for building flumes and drawing water from great ponds for use in flowing cranberry bogs. The right of the Board to revoke a license for drawing water from a great pond containing a clause providing for its revocation in case certain conditions are not complied with, has recently been questioned, and the opinion of the Attorney-General has been requested.

It was stated in the report of the Board for 1902, page 46, that the Attorney-General had been requested to make claim to an island known as Loon or Snake Island in Chebacco Pond in Hamilton, believed to be occupied under claim of squatter right only, and that the matter was pending in his office. The Board was informed on Sept. 25, 1905, that the auditor before whom the case was tried had rendered a decision adverse to the Commonwealth, on the ground that, the town of Ipswich having been settled before 1647, and having at the time of its settlement become vested with the title to the lands and ponds within its limits, the effect of the ordinance of 1647, so far as great ponds were concerned, was merely to secure certain rights of enjoyment to the public, but not to take from the town the legal title. From which it appears that the substantial question to be decided is,

whether the Commonwealth, as against an unlawful intruder, does or does not own an island in a great pond where there is nothing to defeat the title of the Commonwealth to the pond except the fact that it is situated within the limits of the town established and recognized by the colony before the passage of the colony ordinance of 1641-47.

The matter is pending before the Supreme Judicial Court on questions of law to be argued at the November sitting of the court.

PROVINCE LANDS.

The reclamation of the territory belonging to the Commonwealth known as the Province Lands, located in Provincetown and containing about 3,290 acres, has been in progress under the direction of the Board since 1893. The method adopted for this work is the planting of beach grass, shrubs and trees to cover and hold the blowing sands, and has been fully described in previous reports of the Board.

By chapter 396 of the Acts of 1905 a further appropriation of \$10,000 for the reclamation of these lands was made, one-third of the same to be expended in each of the three years after the passage of the act. About 270 acres have been covered with beach grass since the commencement of work of that character in the spring of 1895, leaving about 45 acres of barren sand dunes yet to be covered.

A road across this property to Race Point life-saving station, 10,200 feet in length, has been built under previous appropriations, at an expense of \$3,450.

The sum of \$142.52 has been received during the year from licenses which have been issued to various parties to cultivate and pick cranberry bogs on these lands.

The report of the superintendent of these lands may be found in the appendix.* The Department of Agriculture at Washington continues its interest in the reclamation of the sand barrens on the Cape.

The amount expended during the year was \$3,430.64.

The total expenditure on these lands to Dec. 1, 1905, is \$38,647.84.

* See Appendix B.

TAXATION OF FOREST LANDS.

On May 15, 1905, the provisions of chapter 60 of the Resolves of 1905, relating to the appointment of a committee to consider the laws relative to the taxation of forest lands, were considered, and the chairman of this Board was chosen to act as a member of said committee.

FALL RIVER.

In July, 1905, the Board, acting under authority of chapter 471 of the Acts of 1905, and with the approval of the Governor and Council, executed a deed to the Old Colony Street Railway Company of tide-water land in Mount Hope Bay in Fall River, described in License No. 2773, granted by the Board to said company July 29, 1903. The consideration named in the deed was \$100, being in addition to the sum of \$2,000 paid into the treasury of the Commonwealth by said company for rights and privileges granted in tide-water land of the Commonwealth by said license.

STATE BOUNDARIES.

For the purpose of preserving and maintaining the monuments and marks on the State boundary lines, section 4 of chapter 1 of the Revised Laws requires that the Board of Harbor and Land Commissioners shall in the year 1905 and every fifth year thereafter examine and inspect all the monuments or other marks defining the location of the boundary lines of the Commonwealth; and if any of them have been injured, displaced, removed or lost, said commissioners shall, in co-operation with persons duly authorized by the adjoining State, restore them or replace them with suitable stone monuments, and in the same manner set suitable stone monuments at points not properly marked, where the State boundary is intersected by the boundary of any counties, cities or towns in the Commonwealth, or by a highway or railroad.

In order to defray the expense to be incurred in the performance of the foregoing duty, an appropriation of \$1,500 was made by the last Legislature.

The Board, by correspondence with the executive depart-

ments of the several adjoining States, arranged for a perambulation of the State boundaries with New Hampshire, Vermont and Connecticut. The State of Rhode Island failed to respond to the invitation. The State of New York perambulated its boundary line in 1902.

The result of the performance of the duties required by the statute is reported as follows:—

Boundary Line between Massachusetts and New Hampshire.

The boundary line between these two States remained unsettled for more than two hundred years. As long ago as 1693 efforts were made to fix the boundary line, but without success. Commissioners were appointed at various times in the eighteenth century, without being able to reach any agreement.

In the year 1740 the King in council ordered and adjudged “That the Northern Boundaries of the province of the Massachusetts Bay are and be a similar curved line Pursuing the course of the Merrimack River, at three miles distance, on the north side thereof, beginning at the Atlantic Ocean and ending at a point due north of a place in the plan returned by the said Commissioners, called Pawtucket Falls, and a strait line drawn from thence due west across the said river till it meets with His Majestys other Governments. . . .”

In March, 1741, George Mitchell was appointed to run the “similar curved line” from the ocean to the point north of Pawtucket Falls, and Richard Hazen to run the straight line due west. They both started from a pitch pine tree nearly 3 miles north of Pawtucket Falls, now Lowell, and thereafterwards known in the many commissioners’ reports as the “Boundary Pine.”

Far from settling the boundary, the result of this action created great dissatisfaction, and the many efforts to agree upon the line run by Mitchell and Hazen as the true boundary failed, until in 1885 commissioners were appointed by both States to jointly ascertain and re-mark the line as defined in 1740–41.

From the “Boundary Pine” at Lowell eastward to the

sea these joint commissioners found monuments which they identified as marking the angles originally located in 1741, and ran lines connecting them.

From Lowell westward they agreed that the nearest approach to the line as originally run out was a series of straight lines connecting the existing town corner bounds, and so marked the line.

The boundary thus ascertained was established by the Legislature of Massachusetts, chapter 369 of the Acts of 1899; and by the Legislature of New Hampshire, chapter 115 of the Acts of 1901.

For the history of this boundary line see report of Commissioners to ascertain and establish the Boundary Line between Massachusetts and New Hampshire, Mass. House Doc. No. 490, 1889, and House Doc. No. 860, 1899; also, Bulletin No. 226 of the United States Geological Survey, upon boundaries of the United States and of the several States and Territories, 1904.

In September, 1905, authorized representatives of Massachusetts and New Hampshire met by appointment, and perambulated the boundary line between the two States. All the bounds were found to be in place and in good condition except No. 117, at the turnpike called Broadway, in Methuen. This bound apparently was not set deep enough, and was thrown out of plumb so as to lean about 12 inches from the vertical. Also, No. 132, at Hildale Avenue, Haverhill, was in a similar condition, although at present it leans only about 5 inches out of the perpendicular.

These monuments have now been severally reset in their respective identical locations.

Boundary Line between Massachusetts and Vermont.

The boundary line between the Commonwealth and Vermont is a continuation of the line between New Hampshire and Massachusetts, which was run by Richard Hazen in 1741 from "Boundary Pine" on the New Hampshire line through to the Hudson River, and no contention has ever arisen as to its location.

The line, however, remained unmarked by monuments

until the twentieth century, when, after a preliminary survey of the line between the northwest corner of Massachusetts and the Connecticut River, made to determine the relative position of the town corners and fences connecting the line of occupation between the States and such other monuments or points as might be used in aiding a final agreement, monuments were set and marked by commissioners representing both States as on the New Hampshire line.

The line was finally established by the Legislature of Massachusetts, chapter 131 of the Acts of 1900; and by the Legislature of Vermont, chapter 137 of the Acts of 1900.

For a history of this line see Mass. House Doc. No. 300, 1900.

A perambulation of this line was made in October, 1905, by authorized representatives of the Commonwealth and the State of Vermont, who duly met at an appointed time and place, and together visited and examined the monuments. All the bounds were found to be in place and in good condition, with the following exceptions: No. 9, at the corner of Bernardston, Guilford and Leyden, is very loosely set and easily shaken. It stands in swampy ground, and is liable to be forced further out of place. No. 31, at Jilson Hill, between the towns of Rowe and Whitingham, leans about 7 inches from the perpendicular toward the west and south. There are deep holes in the ground around the base of the monument, and it is liable to fall over still further. The ground around this monument is also soft and springy.

These monuments will be severally reset in their identical locations.

Boundary Line between Massachusetts and Rhode Island.

The charter of New Plymouth was obtained in 1629. Although it gave the colonists the highest prerogatives of sovereignty, yet, as it was not confirmed by the Crown, it failed to become a duly incorporated body politic, and so remained until 1691, when it was united with the Colony of Massachusetts.

Meantime, in 1663 a royal charter was granted to Rhode Island, which, encroaching upon the Plymouth patent, gave

rise to disputes relative to the boundary line between Rhode Island and Massachusetts, which were not settled for over two hundred years.

Many commissioners were appointed and many reports made, and twice the differences were carried to the Supreme Court of the United States during this period of controversy.

The history of the differences and final settlement may be found in Mass. House Doc. No. 102 for the year 1861; in Sen. Doc. No. 34 for the year 1883; in the report of the Commissioners on the Topographical Survey, House Doc. No. 1230 for the year 1899; and in Bulletin No. 226 of the United States Geological Survey, 1904.

It is sufficient for the purpose of this report to say that the boundary line from Burnt Swamp corner west to the Connecticut line was finally established by Massachusetts, chapter 154 of the Acts of 1883, and Rhode Island, chapter 342 of the Acts of 1883; and that the boundary line between the Commonwealth and the State of Rhode Island from Burnt Swamp corner southerly to the sea was established by Massachusetts, chapter 476 of the Acts of 1899, and Rhode Island, chapter 683 of the Acts of 1899.

The whole of this boundary line has been delineated and fully marked by bounds and granite monuments. It has been perambulated by an authorized representative of the Commonwealth, not, however, in conjunction with an agent of the State of Rhode Island, as, although invited, none was appointed to pursue the work jointly.

All the marks along the eastern boundary of Rhode Island are in good condition except six. Two of these, Nos. 74 and 75, stand in meadow land near the banks of Runnins River, between East Providence and Seekonk. They are line stones, and are valuable as reference marks to the angle in Runnins River, where the line bends from a straight line and follows the middle of the river. The angle point is marked by an iron bolt set in the stones of the bridge, and will be destroyed whenever the bridge is rebuilt. The two stones are about 300 and 600 feet from the bridge, and at present are so loose that they can be easily shaken. These stones will be permanently reset in concrete.

Nos. 97 and 98, in the line between Swansea and Warren, stand on the north and south sides of the New York, New Haven & Hartford Railroad. The railroad at this point crosses a meadow on quite a high embankment, and the monuments stand substantially on the two edges of the railroad location in the swampy ground. These stones will be reset so as to be firmly fixed.

No. 101, between Swansea and Warren, is a short distance north of the shore of Mount Hope Bay. It is a small stone, and is practically a reference bound to the large stone which stands on the shore just above high-water mark. At the present time it is loosely set, and leans 7 inches to the south. It will be permanently reset in concrete.

No. 104, between Fall River and Tiverton, on the easterly side of the location of the Newport branch of the New York, New Haven & Hartford Railroad, at the present time is entirely out of the ground, leaning against the bank on the southerly side of State Avenue, a street which follows the boundary line between Massachusetts and Rhode Island at this point. When the line was re-marked in 1898 the bound stood on the top of the bank, and is one of the original bounds which was not disturbed. Since that time the bound has apparently been undermined by the gradual wearing away of the embankment by the water which runs down that side of the ditch from the roadway. It will be reset at a lower grade in the identical location, substantially level with the surface of the present roadway.

Of the monuments marking the northern line of Rhode Island, all were in good condition except as follows:—

No. 26, which marks one of the angles of the line, is buried below the surface, and a new bound is placed on the opposite side of the street; undoubtedly the old bound can be dug up at any time when it is necessary to establish the exact location of the angle. The old bound, which originally projected above the surface, was probably broken off in order not to interfere with adjacent property.

Twelve of the bounds along the line, none of which are at angles, are almost wholly buried in the ground, and are difficult in most cases to find. Larger bounds, which would pro-

ject 4 feet above the surface, will at some future date, in co-operation with the State of Rhode Island, be set alongside these small ones, so that the marks can be more readily found.

Boundary Line between Massachusetts and Connecticut.

The boundary between the province of Massachusetts and the colony of Connecticut has presented questions of conflicting interest from the settlement of the country down to a late date. After many efforts in the seventeenth century, and failure to reach agreements, memorials were forwarded to the King, asking the Crown to settle the disputed boundaries. Without, however, awaiting the action of the Crown, commissioners on the part of the two colonies were appointed in 1713, and made a report in 1714, which was accepted. Subsequently in 1734 a perambulating committee discovered that a mistake at the northwest corner of Woodstock had apparently been made in 1713. The discovery of this mistake caused endless misunderstandings and disagreements, which continued through the eighteenth century. An amicable settlement, however, was finally reached in 1826, when a report was agreed to by both States, and the long-continued controversy was terminated. (Resolves of Massachusetts, 1824-1828, p. 544; chapter 102, Resolves of 1803-04, line west of Connecticut River; Private Laws of Connecticut, Vol. 2, pp. 1540-1544, 1544-1550.)

The line is the original southerly line of the territory granted by the Council at Plymouth to Sir Henry Roswell and others in the third year of the reign of King Charles the First. This grant was afterwards confirmed by the King, and was described as "all the lands lying within the space of three English miles on the south part of Charles River or any and every part thereof."

In 1642 Massachusetts employed Messrs. Woodward and Saffrey to run out the line, but Connecticut did not join in this work, and afterwards disputed it. The line they ran was intended to be a straight line running due west from a point 3 miles due south of the most southern portion of Charles River.

The charter granted to the Colony of Connecticut in 1662 bounds it on the north by the Massachusetts line.

In 1695 Connecticut had the line run out by Messrs. Butcher and Whitney. They began and ran a line supposed to be the same as the Woodward and Saffrey line, but it came out farther north.

In 1713 commissioners were appointed from both States to agree on and mark the line; and Feb. 13, 1714, they reported on the portion of the line east of the Connecticut River, and June 15 in the same year on the portion west of the river. By this agreement Massachusetts was to have the border towns of Enfield, Suffield and Woodstock, which had been settled by Massachusetts, but were located just south of the straight line; and in compensation therefor Connecticut was granted a tract of nearly 108,000 acres, which she sold, and the proceeds were given to Yale College.

The line was perambulated by both States in 1734; but many of the inhabitants of the border towns south of the line desired to belong to Connecticut, although against the protest of Massachusetts.

The matter continued in dispute until in 1749 the Legislature of Connecticut passed a resolution that, inasmuch as the line had not been approved by the King, and that the two colonies had no legal right to transfer territory without the confirmation of the Crown, the contract was void, and these towns were again taken under the jurisdiction of Connecticut. Massachusetts appealed to the King, but the claims of Connecticut were allowed.

Massachusetts was still dissatisfied, and in 1791 commissioners were appointed by both States to locate and mark the line, the commissioners from Connecticut, however, being limited to the establishment of the line west of the Connecticut River. But these commissioners were unable to effect any agreement, and so reported in 1802. The possession of the border towns still continued to be the subject of their differences.

The Massachusetts Legislature of 1802 requested the Governor to propose a compromise to the Governor of Con-

necticut; and in 1803, the same having been accepted, commissioners from both States were appointed to complete the running out and re-marking the boundary line in accordance therewith.

The act appointing the commissioners provided that the line as marked by them should be the boundary line; but their joint report was confined to the line west of the Connecticut River, reciting, however, that they knew of no dispute regarding the line to the eastward. (See chapter 102 of Massachusetts Resolves of 1803, dated Feb. 18, 1804.)

The portion east of the Connecticut River remained unidentified until 1825, when the Governor was authorized to appoint commissioners for ascertaining and establishing this portion of the line, which, when defined, was forever afterwards to be the true boundary line between the two States.

The joint report of the commissioners was made to Massachusetts, and ordered by the Legislature in 1827 to be deposited and recorded in the Secretary's office, and to be printed with the Resolves of that year.

And from that time no dispute or misunderstanding has ever arisen as to the true boundary line between the two States.

The line, however, has not been surveyed since it was originally laid out and marked westerly from the Connecticut River in 1803 and easterly therefrom in 1826.

In 1899 the Massachusetts Topographical Survey Commissioners reported to the Legislature (Pub. Doc. No. 50) that a preliminary examination of a greater part of the line had been made, and it was found to be in an unsatisfactory condition. As to the portion east of the Connecticut River, while most of the angles named in the 1826 survey were marked, many of the monuments were found to be defaced and broken, and others not upright; the bounds were not of uniform size, not properly marked, and 75 points required new bounds.

The portion of the line west of the Connecticut River was in a far worse condition, and over 50 per cent. of the bounds at the highways were missing.

They reported that the whole line should be surveyed, and the location of all corners and summits determined by trian-

gulation; the position of road stones should be tested, and the stones replaced on the line wherever wrongly put; that 130 granite monuments should be set, and 45 old ones reset, at an estimated cost of \$14,000, or \$7,000 for each State.

In the following year the entire line was perambulated, all the existing bounds and marks photographed, and a report of dimensions, descriptions and locations, together with special remarks, was made for the purpose of gaining a complete record of the situation.

In the year 1905 the Legislatures of Massachusetts and Connecticut severally appropriated the sum of \$7,000 to cover the expense of rehabilitating the boundary line. This Board and the Connecticut Commissioners have met and made arrangements for perambulating the line, restoring and replacing all defaced and broken monuments, and adding such new ones as may be deemed necessary. When this work shall have been completed, the line may be perambulated once in five years, as required by the statutes, and the monuments preserved at comparatively slight expense.

Boundary Line between Massachusetts and New York.

From the days of the colonial charters the State boundary line between Massachusetts and New York seems to have been involved in entanglement and controversy. In this report, however, it would not be profitable to inquire into its history prior to the year 1773, when the action then taken appears, from the annual report of the State Engineer and Surveyor of the State of New York for the fiscal year ending Sept. 30, 1899 (page 200), to have been as follows:—

By act of the New York Assembly, passed March 8, 1773, "Commissaries" were appointed "to settle a Line or Lines of Jurisdiction, between this colony and the Province of the Massachusetts Bay." Commissioners with like powers having been appointed by Massachusetts, the joint commission met at Hartford, where it was unanimously agreed that "a line beginning at a place fixed upon by the two governments of New-York and Connecticut, in or about the year of our Lord one thousand seven hundred and thirty-one, for the northwest corner of a tract of land commonly called the Oblong, or equivalent land; and running from the said corner north twenty-one degrees, ten

minutes and thirty seconds east, as the magnetic needle now points, to the north line of the Massachusetts Bay, shall at all times hereafter be the line of jurisdiction between the said province of the Massachusetts Bay and the said province of New-York, on its eastern boundary, shall adjoin the said province of the Massachusetts Bay."

The course north twenty-one degrees, ten minutes and thirty seconds east, is the general course of the Hudson River, as determined by survey in the winter of 1772.

From this it is obvious that the westerly boundary of Massachusetts was intended to be a straight line from beginning to end.

Owing to a disagreement of the commissioners, the line was then run no more than 20 miles. In 1784 both States requested Congress to appoint commissioners to carry out the agreement of 1773. In 1787 commissioners appointed by Congress met at the south end of the line, and, finding that a line run under the agreement would describe a curve, reported as follows, viz.:—

Your commissioners afterwards, in order to save time, trouble and expense, proposed, instead of such a curve, to run a straight line or great circle of the globe—that is, to give equal tracts of country to each State that the curve would have done. . . . The equivalent line was found to be 11' 40" more westerly than the curve at the place of beginning—that is 15° 2' 9" east of the true meridian, which direction we carefully ascertained by many astronomical observations and afterwards pursued the same . . . to the northern boundary of the State of Massachusetts.

The line thus determined was accepted by both States as the jurisdictional line, and remained in force in its entirety until the cession of the Boston Corner tract was made.

It was marked by stone heaps, stakes and crosses cut in rocks.

Boston Corner, so called, at the south end of the line, embracing 1,010 acres, was set off and ceded to the State of New York in 1853, accepted by New York and subsequently ratified by act of Congress Jan. 3, 1855. Because of the substantial size of area ceded, it was doubtless thought an act of Congress was desirable, in order to avoid the possible inference that it might affect a political division of the country.

In the annual report of the State Engineer and Surveyor of New York for the year 1903, on page 86, he says this line "was re-established in 1897, 1898 and 1899 by officers of the State of New York and of the Commonwealth of Massachusetts, and during these years was marked by 121 monuments, of which number 83 are granite and 38 iron."

In the report of the Massachusetts Topographical Survey Commission, House Doc. No. 1100 [1900], page 4, it is said that:—

The principle on which the present boundary was founded was proclaimed in 1664. In that year the royal commission which had been sent out to visit various colonies in New England, and which had been given, among other duties, that of determining the boundaries between different colonies in disputed cases, declared the western boundary of Massachusetts to be a straight line 20 miles easterly from the Hudson River, and parallel with its general direction in this latitude. The location of the southerly end of the line appears to have been generally agreed to, but the direction of the line was the cause of much dispute.

On page 8 it is said:—

The only change in this line since 1787 is that authorized by chapter 340 of the Acts of 1853, and ratified by Congress Jan. 3, 1855, by which the southwesterly corner of Massachusetts, known as "Boston Corner," and containing 1,010 acres, was ceded to the State of New York, in order to insure adequate police protection to territory which was the scene of much lawlessness. Plans of this "Corner" are on file in the State departments at Boston and Albany.

On page 9 it appears that in 1887 the line was run by the New York State Engineer and Surveyor, and but few marks were found which could be identified.

In 1836 Simeon Borden, an eminent surveyor, who was then employed by the Commonwealth to make a map of Massachusetts, not finding any monument to mark the boundary line at the junction of Massachusetts, Vermont and New York, placed a marble monument on the spot where he thought the true bounds of these three States conjoined.

It would be impossible for the Borden bound to co-exist in conjunction with other well-defined and accurately established and agreed monuments, and form a straight line.

In 1892, by chapter 678 of the Acts of that year, New York established and defined all her boundary lines; and the State Engineer and Surveyor was directed every third year to examine all the monuments marking the State boundaries, and to replace or repair any lost or injured bounds, in co-operation with the representatives of adjoining States. In section 3 of said act the line is described as running from a marble post at Boston Corner marked on the east side M S, on the west side N Y and on the south side 1853; "thence along the line as the same was laid out by the United States Commissioners in 1787, north $15^{\circ} 12' 9''$ east, 47 miles 73.81 chains, to a marble post marking the junction of the New York and Massachusetts line with the southern line of Vermont." To run a straight line, passing through well-identified monuments, and terminate at the Borden monument, would be impossible; either the straight line would have to disregard established monuments, or deviate at some point. The joint State survey hereinafter cited discovered the deviation.

In 1899 the Massachusetts Topographical Survey Commission and the New York State Engineer and Surveyor, acting jointly under the authority of legislative enactments of their respective States, re-covered and re-marked the old line of 1787. In so doing they discovered that the stone marking the northwest corner of Massachusetts was located 58 feet east of the true line; whereupon, with the concurrence of the Vermont Commissioners and the Massachusetts special commission appointed to act concurrently with the Vermont Commissioners in re-marking the boundary line between the States of Vermont and Massachusetts, the Massachusetts Topographical Survey Commission and the State Engineer of New York moved and set the stone on the spot agreed by all four bodies to be the true point of intersection of the boundary lines of the States of Massachusetts, Vermont and New York.

The extreme care and accuracy with which this work was done is shown in the report of the Massachusetts Topographical Survey Commission for the year 1899. From pages 10 and 11 of that report the following is quoted:—

The line is straight for a distance of 47.2 miles. The difficulties incident to developing a perfectly straight line of this length upon the ground can only be known by those who have undertaken a similar task. A preliminary study showed that points that were supposed to be nearly on the line in 1787 could not be identified; it was therefore determined to adopt for the preliminary survey a base line which would represent as nearly as possible an average of the old stone piles and other marks already found. By running out this average line with the greatest possible accuracy, and connecting it with all the marks that could be found along its length, it was anticipated that some more favorable line could be found to represent the permanent line. To do this involved the selection of a point on Mount Misery opposite an old 1787 transit post, and far enough east, as shown by recent survey, to make the line follow the average line of stone piles at this northerly part of the line. Here a tripod signal was erected, and heliotrope flashes sent down the line toward Alandar Mountain, on which a point was selected that represented the average of the marks in this vicinity. This point was used as an instrument station for sighting to the flash on Mount Misery as a foresight, a distance of 37.9 miles; and, with the aid of the line thus established, a point was fixed on Mount Harvey, situated 16.3 miles north of Alandar. With these three points well set in line, other points were interpolated by the usual methods, and the straight line prolonged north of Mount Misery by transiting a distance of about 10 miles.

This base line was measured, and a rough profile taken. The points on the summits thus carefully established in line with each other were then connected with stations in the State primary system of triangulation by Mr. James B. Tolley, and their geodetic positions computed, to check both the alignment and the measurement. The result shows the base line work to be in good accord with the triangulation, and the azimuth of the line agrees within 13" with that determined over one hundred years ago with cruder instruments and methods. Upon the completion of the survey it was found that this line had been run with so much care and was so near the probable line adopted in 1787 that it was difficult to determine how it could be materially improved. Near the southern extremity it was 1.9 feet east of the middle point between the M and N Y marks on the ledge on Alandar Mountain, and 1.8 feet west of the chiseled arrow between the M and N Y cut on the ledge at Mount Prospect a few miles further north. Near the northern extremity of the line it was a few feet east of the stone pile on Mount Misery, supposed to be the twelfth transit post of 1787, and a few feet west of the stone pile on Berlin Mountain, supposed to be the fifteenth transit post, and it passed directly through the stone pile on

Rhodes Pinnacle, known to be the fourteenth transit post. It also passed through or close to several other well-identified old boundary marks. A wide divergence of about 58 feet to the east at the northern extremity of the line was disclosed by the survey. This divergence occurred in the last three-quarters of a mile, due, perhaps, to some error in the old survey in running by compass down the steep slope of Jim Smith Hill. Finally, the line determined with so much care was adopted; and, at a conference between the State Engineer and Surveyor of New York and this commission, the following agreement, providing for the setting of the bounds, was made.

Again, from page 13:—

Forty-seven new granite monuments 12 inches square and 9 feet long, 36 new granite monuments 12 inches square and 5 feet long, and 26 new cast-iron posts 5 feet long, set in concrete masonry, have been placed to mark the line; and 1 old road stone and 2 stone bounds at town corners have been re-set on the line.

The bound at the northwest corner of the State, set in 1896 by special commissioners of Massachusetts and Vermont, was found to be 58 feet too far to the east. By the consent of these commissioners this bound was moved westerly along the northerly boundary line produced, 58 feet to the point of intersection of the westerly and northerly lines, as now defined and marked.

Also, from page 14:—

Finally, acting with the officers or agents duly authorized by the State of New York, we have located, defined and marked the true line between the territory under the jurisdiction of the Commonwealth of Massachusetts and that under the jurisdiction of the State of New York.

A record plan, including a profile of the line, has been prepared, showing the location of all the monuments, town corners and road crossings, which, with five other plans and a description of the line, have been approved by the authorized agents of the two States, and filed with the Secretary of the Commonwealth.

In 1901, by chapter 374, the Legislature of Massachusetts passed an act establishing the boundary between the Commonwealth and the State of New York on the line which terminated at the northwest corner of the State in the bound heretofore referred to as set by the four representative bodies in 1899; and provided that the same should take effect on

the first day of September in the year 1901, or as soon thereafter as a similar act passed by the State of New York, establishing the line described in this act, shall take effect. The draft of a similar act was reported by the State Engineer and Surveyor to the New York Legislature, but has not as yet been enacted into a law.

Ratification by Congress.

It having been questioned as to whether or not an act of Congress ratifying the action of States in delineating a common boundary line were essential to the validity of the jurisdiction so determined, and inasmuch as the States bordering on Massachusetts at different times concurrently with her had straightened lines, replaced monuments and made some slight alterations in their boundaries without inviting the confirmation of Congress, it would seem appropriate to state the law as determined by the Supreme Court at Washington, interpreting the meaning of that clause in the Constitution upon which the doubt seems to be founded.

The Constitution, in article 1, section 10, provides that no State shall without the consent of Congress enter into any agreement or compact with another State. Through a series of decisions of the Supreme Court this provision has come to be interpreted as meaning, not that there are no matters upon which States may make agreements, but that such agreements as may be made shall not affect the political integrity of the several States, or have a tendency to change their relationship to the United States.

Therefore, it would seem that an agreement or compact between two States, which, in establishing a boundary line, set over or interchanged inconsiderable areas for the purpose of straightening or more clearly indicating the same, the effect of which bore upon property rights only, and had no tendency to change the power or political relationship already existing between the States themselves or in their relationship to the United States, would not be repugnant to the Constitution or require the confirmation of Congress.

All changes made in establishing the boundaries of the Commonwealth are well within this rule except the ceding

of 1,010 acres at Boston Corner to New York in 1853, in confirmation of which Congress enacted a law.

The Board recommends legislation relative to the removal or alteration of State boundary monuments, and will submit a draft of an act to accomplish that purpose.

TOWN BOUNDARY SURVEY.

The work of determining the location of town boundaries has continued with the same organization as for the past few years. Two field parties were engaged on it from early in May to the middle of November. Previous to the latter date the field work necessary to mark the location of the new corners established on the boundary lines between Hamilton and Ipswich, Sandwich and Mashpee and Plainville and Wrentham had been done.

The permanent members of the field force have been engaged during the winter in plotting the results of the previous season's work, and preparing the data necessary for use in the field work of the next year.

One field party was engaged in the location of bounds of a series of 16 cities and towns in the southern portion of Worcester County, and the survey of the rivers and roads forming portions of these boundaries. The other party was engaged in determining the boundaries of two groups of towns in the northern part of Middlesex County, including the survey of streams and roads forming portions of the boundaries of these towns. In all, the two parties determined by triangulation the location of 239 bounds marking the angles in town lines, and made surveys of a little more than 20 miles of streams, roads and shore lines of ponds.

In the prosecution of the work a number of boundary lines were found to be very crooked, and in certain cases the town officers expressed a wish that they might be straightened; consequently, after consultation with the officers, the Board submitted to these towns for their concurrence plans for changing and straightening portions of the boundary lines between them. Five of the towns, viz., Hamilton, Wenham, Leominster, Paxton and Holden, assented to the proposed changes, but the town of Lancaster declined to concur.

In the case of the boundary lines established by the Legislature of 1905, the Board has caused its engineers to set stakes at the new corners, and later the necessary stone monuments were set by the town officers.

The office force has been employed in computing the positions of town corners and triangulation stations whose positions were determined by the field parties the previous season; in making abstracts from the statutes relating to the establishment of the town boundaries; and preparing the results of the work for permanent record. The examination of the early court records for information in regard to the establishment of these boundaries has been completed, and the indexing of the field notes has been well advanced.

Three new atlases, describing the boundary lines of forty cities and towns, viz., Newton, Dedham, Dover, Needham, Wellesley, Westwood, Foxborough, Medfield, Norwood, Sharon, Walpole, Ashland, Framingham, Bellingham, Franklin, Holliston, Medway, Millis, Natick, Norfolk, Plainville, Sherborn, Wrentham, Gloucester, Newburyport, Amesbury, Essex, Georgetown, Groveland, Hamilton, Ipswich, Manchester, Merrimac, Newbury, Rockport, Rowley, Salisbury, Topsfield, Wenham and West Newbury, have been distributed during the year.

Another atlas, describing the boundaries of 11 cities and towns, viz., Andover, Boxford, Haverhill, Lawrence, Lynnfield, Methuen, Middleton, North Andover, North Reading, Reading and Wilmington, is now in the hands of the printer; and the material for another atlas, describing the boundaries of 14 cities and towns, viz., Ayer, Billerica, Carlisle, Chelmsford, Dracut, Dunstable, Groton, Littleton, Lowell, Pepperell, Shirley, Tewksbury, Tyngsborough and Westford, is being prepared for the printer.

On the first of December, 1905, atlases describing the boundaries of 139 cities and towns, out of a total of 354 in the Commonwealth, had been completed and distributed as provided by the statute; and an atlas containing the descriptions of 11 additional cities and towns was in the hands of the printer.

SALE AND DISPOSITION OF MASSACHUSETTS ATLAS SHEETS
AND TOWN BOUNDARY ATLASES.

There has been paid into the treasury of the Commonwealth during the year, under authority of chapter 57 of the Resolves of 1890 and chapter 360 of the Acts of 1900, the sum of \$241.40, received from the sale of Massachusetts atlas sheets and town boundary atlases. Under chapter 360 of the Acts of 1900 one hundred and nineteen town boundary atlases have been distributed among the officers of the various cities and towns and others. Under chapter 95 of the Resolves of 1891 one topographical atlas has been given to the Civil Service Commission and one to the State Forester.

INSPECTIONS MADE DURING THE YEAR.

The following inspections have been made by and under the direction of the Board:—

1905.

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| Mar. | 28—30. | Stage harbor, at Chatham; Herring River; Bass River, at South Yarmouth; Lewis Bay; East and West bays, at Osterville, — in company with legislative committee. |
| Apr. | 24—26. | Nantucket harbor; Vineyard Haven harbor; Menamsha Inlet; Cuttyhunk harbor; Paskamansett River and Apponagansett harbor, — in company with legislative committee. |
| May | 1. | Site of proposed pier in tide water, at Beverly. |
| May | 3. | Work in progress on the Commonwealth flats, at South Boston. |
| May | 8. | Work done by the Commonwealth at Bass River, South Yarmouth; East and West bays, Osterville; Cotuit harbor. |
| May | 12. | Site of proposed marine railway at Winthrop, in Boston harbor. |
| May | 26. | Protective works on Connecticut River, at Hadley and Hatfield. |
| June | 6. | Connecticut River bank, at West Springfield. |
| June | 16. | Bridge of New York, New Haven & Hartford Railroad Company across Cohasset Narrows, in Bourne and Wareham. |
| June | 23. | Province Lands, at Provincetown. |

1905.

- June 27. Site of proposed breakwater north of Cherry island bar, in Revere, authorized by chapter 108, Resolves of 1905.
- July 7. Paskamansett River; Cuttyhunk harbor; Menamsha Inlet; Vineyard Haven harbor; Lake Anthony and Nantucket harbor,—relative to improvements authorized by the Legislature.
- July 13. Site of proposed bridge across Danvers River, between Salem and Beverly, and approaches thereto, authorized by chapter 371, Acts of 1903.
- July 28. Site of proposed breakwater in Folly Cove, Gloucester.
- Sept. 21. Nashawena Island, in relation to a harbor.
- Oct. 7-9. Work done by the Commonwealth at Stage harbor; Bucks Creek; Witchmere harbor; Herring River; East and West bays, Osterville; Cotuit harbor.
- Oct. 16. Dike on Connecticut River, at Hatfield, built by the Commonwealth.
- Oct. 26-29. Boundary line between Massachusetts and New York.
- Nov. 16. Work done by the Commonwealth at Stage harbor; Lewis Bay; Bass River, at South Yarmouth; Witchmere harbor; Herring River.

LICENSES GRANTED DURING THE YEAR.

Nos.

2907. Petition of the Kilburn Mill for license to lay a pipe and construct two wells for condensing purposes in Clark's Cove, in the city of New Bedford. Granted Dec. 7, 1904.
2908. Petition of the Old Colony Railroad, the New York, New Haven & Hartford Railroad Company, lessee, for license to rebuild its bridge across Broad Cove, in Dighton and Somerset, and to fill solid. Granted Dec. 19, 1904.
2909. Petition of the Old Colony Railroad, the New York, New Haven & Hartford Railroad Company, lessee, for license to fill solid a portion of its bridge, known as Bridge No. 209, across a cove in Taunton River, in Taunton. Granted Dec. 19, 1904.
2910. Petition of Elbert S. Kip for license to build a pile wharf on Vineyard Sound, in Falmouth. Granted Dec. 19, 1904.

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2911. Petition of the city of Boston for approval of plans for the construction and maintenance of a water pipe box and a tunnel for a water pipe across Fort Point Channel, near Dover Street bridge, under authority of chapter 273 of the Acts of 1904. Granted Dec. 26, 1904.
2912. Petition of Charles Whittemore for license to build a sea wall and fill solid in Buzzards Bay at Long Neck, in Wareham. Granted Dec. 28, 1904.
2913. Petition of the city of Salem for approval of plans for laying and maintaining a 60-inch iron pipe sewer in Collins Cove, in Salem, under authority of chapter 353 of the Acts of 1901. Granted Dec. 29, 1904.
2914. Petition of the Dartmouth Manufacturing Corporation for license to fill solid on Acushnet River, in New Bedford. Granted Dec. 29, 1904.
2915. Petition of Nancy E. Bliss for license to build and maintain a wharf, marine railway and float stage in Pocasset harbor at Pocasset, in Bourne. Granted Dec. 29, 1904.
2916. Petition of James H. Dwinell for license to build and maintain a pile pier and float stage in Pocasset harbor at Cataumet, in Bourne. Granted Jan. 3, 1905.
2917. Petition of Linda Winsor for license to build and maintain a pile pier, marine railway and float stage in Pocasset harbor at Cataumet, in Bourne. Granted Jan. 3, 1905.
2918. Petition of Henry N. Richards for license to build and maintain a pile pier and float stage in Pocasset harbor at Cataumet, in Bourne. Granted Jan. 3, 1905.
2919. Petition of Boston & Maine Railroad for license to rebuild its Pier No. 5 on Charles River, in Boston. Granted Jan. 3, 1905.
2920. Petition of the Old Colony Street Railway Company for license to construct a pole line in and over North Watuppa Pond, in Fall River. Granted Jan. 23, 1905.
2921. Petition of the city of New Bedford for license to build a bulkhead and fill solid on Acushnet River, in New Bedford. Granted Jan. 26, 1905.
2922. Petition of Greene & Wood for license to build a bulkhead and fill solid on Acushnet River, in New Bedford. Granted Jan. 26, 1905.
2923. Petition of the Pairpoint Corporation for license to build a bulkhead and fill solid on Acushnet River, in New Bedford. Granted Jan. 26, 1905.

Nos.

2924. Petition of Edith Hastings for license to build a bulkhead and fill solid on Acushnet River, in New Bedford. Granted Jan. 26, 1905.
2925. Petition of Boston & Maine Railroad for license to build a temporary pile bridge across Merrimac River, in Haverhill. Granted Jan. 26, 1905.
2926. Petition of Francis J. Cain for license to build and maintain a pile wharf and float stage on Weymouth Fore River, in Weymouth. Granted Jan. 30, 1905.
2927. Petition of the Nobnocket Club for license to build a pile pier in Vineyard Haven harbor, in Tisbury. Granted Jan. 30, 1905.
2928. Petition of the Continental Export Company for license to build a pile wharf and to dredge in Boston harbor, at Spectacle Island. Granted Jan. 30, 1905.
2929. Petition of Alexander C. Adams and John A. Morse for license to build a pile and timber jetty in Cotuit Bay, at Cotuit, in Barnstable. Granted Jan. 30, 1905.
2930. Petition of Herbert M. Sears for license to build and maintain a pile pier and float stage in Salem harbor, in Beverly. Granted Feb. 3, 1905.
2931. Petition of Bessie Goldberg for license to build a pile structure on South River, in Salem. Granted Feb. 3, 1905.
2932. Petition of the Marblehead Transportation Company for license to build and maintain a sea wall, marine railway and float stages, and to fill solid, in Marblehead harbor, in Marblehead. Granted Feb. 10, 1905.
2933. Petition of the trustees of the New England Real Estate Trust, and the Walworth Manufacturing Company, for license to build bulkheads and fill solid in Boston harbor near the Reserved Channel, at South Boston. Granted March 6, 1905.
2934. Petition of the trustees of the New England Real Estate Trust for license to build bulkheads and fill solid in Boston harbor near the Reserved Channel, at South Boston. Granted March 6, 1905.
2935. Petition of Ella A. Chesley and William A. Rugg for license to construct a building over Little River, in Haverhill. Granted March 13, 1905.
2936. Petition of A. W. Davis and G. W. Harding for license to construct and maintain a building and pile platform on Duck Creek, in Wellfleet. Granted March 13, 1905.
2937. Petition of Lorenzo D. Baker for license to construct and maintain a building and pile platform on Duck Creek, in Wellfleet. Granted March 13, 1905.

Nos.

2938. Petition of the Boston & Albany Railroad, the New York Central & Hudson River Railroad Company, lessee, for license to rebuild a bridge, on piles, on its Grand Junction Branch across Charles River, in Boston and Cambridge. Granted March 20, 1905.
2939. Petition of the city of Boston for license to rebuild and repair a portion of its wharf on the southerly side of Gallops Island, in Boston harbor. Granted March 23, 1905.
2940. Petition of William B. Stearns and George T. McKay for license to build a pile structure in Marblehead harbor, in Marblehead. Granted March 23, 1905.
2941. Petition of Emma F. Keith for license to build and maintain a pile pier, pile platform and float stage in Hull Bay, in Hull. Granted March 28, 1905.
2942. Petition of the Bliss Coal Company for license to build a pile wharf and to dredge in Lynn harbor, in Lynn. Granted March 28, 1905.
2943. Petition of G. Henry Whitcomb for license to extend his wharf, on piles, on Taunton River, in Fall River. Granted April 4, 1905.
2944. Petition of Albert T. Stearns for license to build a bulkhead and fill solid on Neponset River, in Boston. Granted April 6, 1905.
2945. Petition of the A. T. Stearns Lumber Company for license to build pile structures and fill solid on Neponset River, in Boston. Granted April 6, 1905.
2946. Petition of the estate of Edward R. Talbot for license to extend a wharf, on piles, on Taunton River, in Dighton. Granted April 18, 1905.
2947. Petition of Boston & Maine Railroad for license to extend the fender pier at Draw No. 1 in its bridge across Charles River, in Boston. Granted April 24, 1905.
2948. Petition of Boston & Maine Railroad for license to build and maintain a pile dolphin in Charles River, in Boston. Granted April 24, 1905.
2949. Petition of Catherine Hayes for license to build and maintain a pile pier and float stage in Buzzards Bay at Peters Neck, in Wareham. Granted April 28, 1905.
2950. Petition of Job Churchill for license to build a dike and flume and draw water from John's Pond, in Carver. Granted April 28, 1905.
2951. Petition of the Cottage Park Hotel Corporation for license to build embankments and to excavate in Boston harbor, in Winthrop. Granted May 3, 1905.

Nos.

2952. Petition of the Sewer Commissioners of Fairhaven for license to build and maintain sewers in Acushnet River, in Fairhaven. Granted May 3, 1905.
2953. Petition of the Cambridge Bridge Commission for approval of plans for the construction of a highway bridge without a draw therein, across Charles River between Boston and Cambridge, to be known as Brookline Street bridge, under authority of chapter 391 of the Acts of 1904. Granted May 5, 1905.
2954. Petition of William H. Moore for license to extend a pier, on piles, and locate and maintain a float stage in Massachusetts Bay, in Beverly. Granted May 9, 1905.
2955. Petition of the Charlestown Gas and Electric Company for license to extend its wharf, partly solid and partly on piles, on Mystic River, in Boston. Granted May 9, 1905.
2956. Petition of Burgess & Packard for license to build and maintain two marine railways, on piles, a portion of a building, and a float stage, in Marblehead harbor, in Marblehead. Granted May 11, 1905.
2957. Petition of Freeman M. Crosby for license to build and maintain a pile pier on Vineyard Sound at Centerville, in Barnstable. Granted May 11, 1905.
2958. Petition of the town of Plymouth for license to build and maintain a sewer outlet in Plymouth harbor, in Plymouth. Granted May 15, 1905.
2959. Petition of the Edison Electric Illuminating Company of Boston for license to rebuild and strengthen a portion of its wharf on Fort Point Channel, in Boston. Granted May 16, 1905.
2960. Petition of the Haverhill & Boxford Street Railway Company for approval of plans for the construction of a bridge and approaches thereto across Merrimac River, in Haverhill, under authority of chapter 449 of the Acts of 1904, and chapter 130 of the Acts of 1905. Granted May 17, 1905.
2961. Petition of the Holyoke Water Power Company for license to erect structures for a power plant and to build and extend a shore wall on Connecticut River, in Holyoke. Granted May 17, 1905.
2962. Petition of Guy Norman for license to build and maintain a pile pier in Beverly harbor, in Beverly. Granted May 18, 1905.
2963. Petition of the County Commissioners of Essex County for approval of plans for the construction of a bridge and

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- approaches thereto across Merrimac River, in Haverhill, under authority of chapter 466 of the Acts of 1903, and chapter 411 of the Acts of 1905. Granted May 22, 1905.
2964. Petition of Mary A. Whiting for license to build and maintain a pier in Marion harbor, in Marion. Granted May 22, 1905.
2965. Petition of Catherine Doherty for license to extend a wharf, partly solid and partly on piles, in Dorchester Bay, in Boston. Granted May 31, 1905.
2966. Petition of the city of Boston for approval of plans for the construction and maintenance of a tunnel for a water pipe under the south channel of Mystic River, in Boston, under authority of chapter 273 of the Acts of 1904. Granted June 6, 1905.
2967. Petition of Leonard Thompson for license to build a sea wall, construct a dolphin, fill solid and to dredge, in Hingham harbor, in Hingham. Granted June 8, 1905.
2968. Petition of Boston & Maine Railroad for license to extend piers 6 and 7 at the Hoosac Tunnel Docks on Charles River, in Boston. Granted June 8, 1905.
2969. Petition of Samuel L. Minot and the estate of Joshua Crane for license to build and maintain a pile pier and float stage in Pocasset harbor, in Bourne. Granted June 8, 1905.
2970. Petition of the Home Club for license to build and maintain a pile pier in Edgartown harbor, in Edgartown. Granted June 9, 1905.
2971. Petition of Herbert M. Chase for license to build and maintain a boat landing in Lake Anthony, in Cottage City. Granted June 26, 1905.
2972. Petition of the Haverhill Electric Company for license to lay cables in and under Merrimac River, in Haverhill. Granted June 26, 1905.
2973. Petition of the city of Haverhill for license to construct a submerged outlet for the Mill Street sewer system, in Merrimac River, in Haverhill. Granted June 26, 1905.
2974. Petition of Frederick E. Baker and Zenia E. Strout for license to build a sea wall and fill solid in Lynn harbor, in Nahant. Granted June 29, 1905.
2975. Petition of John C. Haynes for license to build a pile pier and timber breakwater in Buzzards Bay at Sippowissett, in Falmouth. Granted June 29, 1905.

Nos.

2976. Petition of the Marblehead Transportation Company for license to build and maintain a sea wall, marine railway and float stages, and to fill solid, in Marblehead harbor, in Marblehead. Granted July 11, 1905.
2977. Petition of Henry H. Fay for license to build and maintain a marine railway and to dredge, in Woods Hole Great harbor at Woods Hole, in Falmouth. Granted July 20, 1905.
2978. Petition of the Cape Cod Cranberry Company for license to build a flume and draw water from Cook's Pond, in Plymouth. Granted July 20, 1905.
2979. Petition of the Turners Falls Lumber Company for license to hang and maintain two booms in Connecticut River, in Gill and Montague. Granted July 20, 1905.
2980. Petition of the County Commissioners of Essex County for license to build a temporary bridge over the "Canal," in Gloucester. Granted July 28, 1905.
2981. Petition of Paul Butler and Blanche Butler Ames for license to extend their wharf in Gloucester harbor, in Gloucester. Granted July 31, 1905.
2982. Petition of the city of Gloucester for license to build and maintain a pipe way and conduits across the "Canal" near the Cut bridge, in Gloucester. Granted Aug. 1, 1905.
2983. Petition of the Valvoline Oil Company for license to build a pile wharf on Chelsea Creek, in Chelsea. Granted Aug. 1, 1905.
2984. Petition of the Federal Contracting Company for license to build and maintain breakwaters in tide water at Folly Point, in Gloucester. Granted Aug. 25, 1905.
2985. Petition of the Metropolitan Park Commission for license to fill solid at the Quincy Shore Reservation with material dredged from Quincy Bay, and to build a drawless bridge over Sachem Brook, in Quincy. Granted Aug. 25, 1905.
2986. Petition of the County Commissioners of Hampden County for approval of plans for the construction of a bridge over Connecticut River, connecting Exchange Street in Chicopee with Wayside Avenue in West Springfield, under authority of chapter 398 of the Acts of 1904. Granted Sept. 5, 1905.
2987. Petition of the city of Haverhill for license to construct a submerged sewer outlet in Merrimac River, in Haverhill. Granted Sept. 12, 1905.

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Nos.

2988. Petition of the town of Hadley for license to build a drain for surface water and an outfall therefor, on the bank of Connecticut River, in Hadley. Granted Sept. 15, 1905.
2989. Petition of the trustees under the will of John C. Inches, trustees under the will of Martin Brimmer, and others, for license to build a pile wharf at the westerly end of the dock between T Wharf and Long Wharf, in Boston. Granted Sept. 19, 1905.
2990. Petition of the Proprietors of Boston Pier or the Long Wharf for license to build a pile wharf at the westerly end of the dock between Long Wharf and T Wharf, in Boston. Granted Sept. 19, 1905.
2991. Petition of Lennox & Briggs and the Haverhill Gas Light Company for license to lay and maintain a pipe in Little River, in Haverhill. Granted Sept. 26, 1905.
2992. Petition of the Salem Electric Lighting Company for license to rebuild its sea wall, build a new sea wall, drive piles and fill solid, on South River, in Salem. Granted Sept. 28, 1905.
2993. Petition of the Boston Tow Boat Company for license to build a pile pier and to dredge in Boston harbor, at East Boston. Granted Sept. 28, 1905.
2994. Petition of the Nantasket Beach Steamboat Company for license to widen its wharf, on piles, and to build three dolphins, on Weir River, in Hull. Granted Oct. 4, 1905.
2995. Petition of the Walworth Manufacturing Company for license to extend its wharf in Boston harbor near the Reserved Channel, at South Boston. Granted Oct. 4, 1905.
2996. Petition of F. T. Akin & Co. for license to extend their wharf, partly solid and partly on piles, on Acushnet River, in New Bedford. Granted Oct. 5, 1905.
2997. Petition of the city of Boston for license to rebuild its wharf in Boston harbor at the North Ferry, in East Boston. Granted Oct. 5, 1905.
2998. Petition of the heirs of William E. Gutterson for license to extend their wharf, on piles, on Fort Point Channel, in Boston. Granted Oct. 10, 1905.
2999. Petition of the heirs of Sarah H. Stratton for license to extend their wharf, on piles, on Fort Point Channel, in Boston. Granted Oct. 10, 1905.
3000. Petition of the heirs of Nelson Shumway for license to extend their wharf, on piles, on Fort Point Channel, in Boston. Granted Oct. 10, 1905.

- Nos.
3001. Petition of the city of Boston for license to widen the opening for the passage of vessels in Dover Street bridge on Fort Point Channel, in Boston. Granted Oct. 12, 1905.
 3002. Petition of Charles W. Adams for license to build and maintain a pile pier and float stage in Onset Bay, in Wareham. Granted Oct. 31, 1905.
 3003. Petition of Boston & Maine Railroad for license to widen its pile platform at Mystic Wharf on the north channel of Mystic River, and to dredge, in Boston. Granted Oct. 31, 1905.
 3004. Petition of the Metropolitan Park Commission for license to fill solid and to dredge in Broad Sound at the Revere Beach Reservation, in Revere. Granted Nov. 13, 1905.
 3005. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Nov. 17, 1905.
 3006. Petition of the Boston Elevated Railway Company for license to dump snow and ice into tide waters. Granted Nov. 17, 1905.
 3007. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River, in Boston. Granted Nov. 17, 1905.
 3008. Petition of Mary A. Curry for license to build and maintain a pile wharf and a float stage on Back River at Monument Beach, in Bourne. Granted Nov. 20, 1905.
 3009. Petition of the County Commissioners of Essex County for approval of plans for building a bridge over the "Canal" in Gloucester, under authority of chapter 254 of the Acts of 1905. Granted Nov. 20, 1905.
 3010. Petition of Charles E. Davis for license to build and maintain a pile wharf on Lees River, in Swansea. Granted Nov. 21, 1905.
 3011. Petition of Malvina S. Nazro for license to build and maintain a pile wharf and float stage in Buzzards Bay, in Wareham. Granted Nov. 21, 1905.
 3012. Petition of the County Commissioners of Essex County for approval of plans for the construction of a highway bridge and approaches thereto, over Danvers River, between Salem and Beverly, under authority of chapter 371 of the Acts of 1903. Granted Nov. 24, 1905.

PETITIONS DENIED AND WITHDRAWN.

On Dec. 21, 1904, the petition of David C. Percival for license to build a retaining wall in Marblehead harbor, at

Marblehead Neck, was dismissed, it appearing from the deed submitted that there is a restriction against building any structure on the beach in front of upland owned by the petitioner.

On March 23, 1905, it was voted not to lease Noon Island, so called, in Ponkapoag Pond, on petition of Fred H. Bixby and S. Austin Thayer, as it was wanted for the Metropolitan Park.

On April 27, 1905, the Board declined to lease Berry Island in Lake Winthrop, in Holliston, for fear of a possible nuisance.

On May 10, 1905, the petition of the town of Marblehead for license to extend Cliff Street in tide water of Marblehead harbor, was dismissed without prejudice.

On May 17, 1905, the petition of Ambrose A. Martin for license to maintain a pile pier and marine railway in Boston harbor, in the town of Winthrop, was further considered; and it was voted, after public hearing, consideration of statements of petitioner and arguments of counsel and examination of premises, that the building of proposed structures should not be authorized, and the petitioner was given leave to withdraw.

On Oct. 9, 1905, the Columbian Dredging Company, petitioner for authority to dump dredged material on flats near Hunts Hill Point, in Weymouth, was granted leave to withdraw, as the owners of property in the vicinity objected to the same, claiming that it would interfere with access to their land.

On Oct. 25, 1905, the New York, New Haven & Hartford Railroad Company, petitioner for license to draw water from Dennis Pond, in Yarmouth, at its request was given leave to withdraw.

MISCELLANEOUS PERMITS GRANTED DURING THE YEAR.

WATER DEPARTMENT OF THE CITY OF BOSTON. to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Dec. 23, 1904.
BOSTON ELEVATED RAILWAY COMPANY. to dump snow and ice on the Commonwealth flats at South Boston. Granted Dec. 27, 1904.

ISAAC BLAIR & Co., to dump snow from Dover Street bridge into tide water, in Boston. Granted Dec. 28, 1904.

THOMAS BUTLER & Co., to use for storage purposes a portion of the Commonwealth pier at South Boston. Granted Dec. 29, 1904.

FRANK J. HANNON, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Jan. 2, 1905.

CHARLES DUNCAN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Jan. 2, 1905.

THOMAS BUTLER & Co., to use for storage purposes a portion of the Commonwealth flats at South Boston. Granted Jan. 2, 1905.

ESTATE OF PATRICK O'RIORDEN, to use for storage purposes a portion of the Commonwealth flats at South Boston. Granted Jan. 2, 1905.

JAMES MCGOVERN, to use for storage purposes a portion of the Commonwealth flats at South Boston. Granted Jan. 2, 1905.

JONES & MEEHAN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Jan. 13, 1905.

JAMES F. DOOLEY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Jan. 16, 1905.

MARY DOYLE, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Jan. 24, 1905.

H. P. NAWN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Jan. 24, 1905.

MOULTON & HOLMES, to dump ashes on the Commonwealth flats at South Boston. Granted Feb. 7, 1905.

GEORGE G. CROCKER, ALVIN F. SORTWELL and FREDERIC D. FISK, trustees of the Main Street Land Trust, to dredge material from their flats in Charles River, on the Cambridge side of the channel, near Cambridge bridge. Granted Feb. 8, 1905.

JAMES FEELEY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Feb. 27, 1905.

JAMES MCGOVERN, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Feb. 27, 1905.

- THOMAS A. ELSTON & Co., to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted March 8, 1905.
- JAMES S. SWEENEY, to dump engine ashes on the Commonwealth flats at South Boston. Granted March 9, 1905.
- JOSEPH L. BOARDMAN, to remove gravel from Salter's beach, in Plymouth. Granted March 15, 1905.
- NAHANT & LYNN STREET RAILWAY COMPANY, to dredge flats in Lynn harbor, in the town of Nahant, for the purpose of obtaining material for constructing its road bed. Granted April 6, 1905.
- BAY STATE DREDGING COMPANY, to dredge material from Boston harbor, southwesterly of Deer Island. Granted April 10, 1905.
- ESTATE OF PATRICK O'RIORDEN, to dredge material from Boston harbor, southwesterly of Deer Island. Granted April 10, 1905.
- STANDARD OIL COMPANY of New York, to dredge in Chelsea Creek, at and near its property known as Maverick Dock. Granted April 12, 1905.
- METROPOLITAN PARK COMMISSION, to excavate material in Lynn harbor. Granted April 18, 1905.
- JONES & MEEHAN, to use for storage purposes a portion of the Commonwealth flats at South Boston. Granted May 4, 1905.
- C. W. JOHNSON, to remove rocks from the channel of Connecticut River at the "Rapids," between Northampton and South Hadley. Granted May 9, 1905.
- COLEMAN BROTHERS, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted May 31, 1905.
- COLEMAN BROTHERS, to use for storage purposes a portion of the Commonwealth flats at South Boston. Granted June 2, 1905.
- R. S. BRINE TRANSPORTATION COMPANY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted June 12, 1905.
- DAVID BENSHIMOL, to remove stones, kelp and sea weed from Back beach, opposite Sewall Avenue, in Winthrop. Granted June 29, 1905.
- R. S. BRINE TRANSPORTATION COMPANY, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted July 3, 1905.
- WILLIAM BARRETT, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted July 10, 1905.

- MILTON DA COSTA**, to use and occupy Quarantine Rock, in Boston harbor. Granted July 11, 1905.
- NEW BEDFORD, MARTHAS VINEYARD & NANTUCKET STEAMBOAT COMPANY**, to excavate in the dock adjoining the wharf of the New York, New Haven & Hartford Railroad Company, in Woods Hole Great harbor at Woods Hole, in Falmouth. Granted July 20, 1905.
- BAY STATE DREDGING COMPANY**, to dump material dredged from Lynn harbor at the Nahant Beach Parkway. Granted July 20, 1905.
- WILLIAM J. RAFFERTY & Co.**, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted July 26, 1905.
- BAY STATE DREDGING COMPANY**, to dump material dredged from Lynn harbor on Longfellow beach, in Nahant. Granted July 31, 1905.
- THOMAS A. ELSTON & Co.**, to dump on the Commonwealth flats at South Boston material taken from excavations in the city of Boston. Granted Sept. 12, 1905.
- HENRY H. SYLVESTER**, to remove stone from the beach at North Scituate, south of the life-saving station. Granted Sept. 12, 1905.
- METROPOLITAN PARK COMMISSION**, to dump material excavated from Lynn harbor on the northerly portion of the Revere Beach Reservation. Granted Oct. 17, 1905.
- NANTASKET BEACH STEAMBOAT COMPANY**, to remove accumulations of sand in the berths and around Pemberton pier, in Hull. Granted Oct. 18, 1905.
- T. F. WHOLEY**, to dump ashes on the Commonwealth flats at South Boston. Granted Oct. 31, 1905.
- BOSTON BRIDGE WORKS**, to build a temporary pile trestle for the purpose of rebuilding the superstructure of the Boston & Albany Railroad bridge on Connecticut River, in Springfield. Granted Oct. 31, 1905.
- BAY STATE DREDGING COMPANY**, to dump material excavated from Chelsea Creek, in Belle Isle Inlet and adjacent creeks, in Boston and Revere. Granted Nov. 3, 1905.
- EASTERN DREDGING COMPANY**, to dump material excavated from Malden River in the old bed of said river and on certain flats therein. Granted Nov. 9, 1905.
- BOSTON ELEVATED RAILWAY COMPANY**, to dump snow and ice on the Commonwealth flats at South Boston. Granted Nov. 27, 1905.
- EDWARD W. DIXON**, to place the steamer "King Philip" in the Commonwealth dock at South Boston. Granted Nov. 27, 1905.

WORK OF THE UNITED STATES IN RIVERS AND HARBORS OF
THE COMMONWEALTH.

The Board is indebted to Col. W. S. Stanton, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and Lieut.-Col. J. H. Willard, Corps of Engineers, U. S. A., who is in charge of similar work in southern Massachusetts, for the following statements, which show the work accomplished in the rivers and harbors of the Commonwealth during the fiscal year ending June 30, 1905:—

STATEMENT OF COL. W. S. STANTON, CORPS OF ENGINEERS,
U. S. A.

BOSTON, MASS., DEC. 20, 1905.

Board of Harbor and Land Commissioners, Commonwealth of Massachusetts, State House, Boston, Mass.

SIRS:—In compliance with your request of Nov. 2, 1905, I have the honor to furnish the following summary of work accomplished by the United States during the fiscal year ended June 30, 1905, upon the improvement of rivers and harbors in Massachusetts under my charge.

Newburyport Harbor.

Under a contract for repairing both jetties at the mouth of the Merrimac River, and for extending the south jetty, 11,328 tons of rubble stone were deposited in the south jetty. The work which was in progress at the close of the fiscal year has been since completed, 300 linear feet of the south jetty and 550 linear feet of the north jetty having been re-topped, and the south jetty extended 291 feet. Funds are available for extending the north jetty 175 feet, for which a contract will be made during the winter. By a survey made in 1905 it appears that the depth on the bar at the mouth of the river, which prior to the construction of jetties was 7 feet, is now 13 feet, at mean low water.

Breakwater for Harbor of Refuge, Sandy Bay, Cape Ann.

During the year, under a contract (since completed), 62,510½ tons of stone were placed in the western, and 31,786 tons in the southern, arm; total, 94,296½ tons. This breakwater is to be 9,000 feet in length. At the close of the fiscal year it had been built to about mean low water for a length of 2,250 feet, and to partial heights below mean low water for 5,280 feet additional.

Rockport Harbor.

Several small ledges of rock were removed, amounting to 130.6 cubic yards.

Gloucester Harbor.

In the breakwater at the entrance to this harbor 34,040½ tons of stone were deposited, completing 843 feet of the superstructure. Since the close of the year the entire breakwater, 2,065 feet in length, has been completed, including a rubble mound at its end for a lighthouse site.

Lynn Harbor.

Under the project to dredge the channel 200 feet wide from the sea to the anchorage basin, and the anchorage basin itself to the depth of 15 feet at mean low water, a continuing contract was made for the completion of the entire improvement by June 30, 1907, and dredging commenced two days before the close of the fiscal year.

Boston Harbor.

Twenty-seven-foot Channel. — In the Narrows the excavation of 24 ledges, covering nearly 4 acres, and amounting to 19,231 cubic yards of rock, has been in progress throughout the year, and has been completed except the removal of a few small points of solid rock and some scattered débris. Early in the year 1906 all ledges will have been removed from this channel 1,000 feet wide and 27 feet in depth from President to Nantasket Roads. During the year 73,441 cubic yards of mud, sand, gravel and clay have been dredged from the channel, in maintenance.

In the upper main ship channel from President Roads to Boston the removal of 11 ledges, embracing 2,066 cubic yards, has been in progress and is substantially completed, except the removal of a few small points of solid rock and scattered débris. The only other ledge remaining to be removed to complete the 27-foot channel is also to be removed in obtaining the 35-foot channel, and has been drilled and blasted, and the dredging of the fractured rock, with the removal of the few points above mentioned, is all that remains to complete the 27-foot channel from Boston to Nantasket Roads.

Thirty-foot Channel. — In Broad Sound 39,568 cubic yards of sand and gravel have been dredged, and 2 ledges of rock containing 156 cubic yards have been removed, completing the channel to the authorized width of 1,200 feet and depth of 30 feet at mean low water from President Roads to the sea. For guiding vessels from the coast to this channel a lighthouse has also been completed on the Graves, from which the light was first exhibited

Sept. 1, 1905, completing, with the range lights on Lovells Island for the seaward arm and on Spectacle Island for the inner arm, the lighting of this channel.

Thirty-five-foot Channel.— Under this project, during the year, from the channel between President Roads and the Navy Yard, Chelsea and Charles River bridges, there were dredged 2,090,011 cubic yards of mud, sand, clay, etc., and 4.2 cubic yards of bowlders; and from the channel between President Roads and the sea, 152,391.5 cubic yards of sand, gravel and clay; making a total of 2,242,506.7 cubic yards. April 26, 1905, a contract was made for excavating 16,555 cubic yards of rock, covering nearly 3 acres, to the depth of 35 feet at mean low water.

Sea Walls.— Minor repairs, consisting of pointing and protecting their foundations with riprap, were made to portions of the 3 miles of sea walls that protect the islands and headlands from the harbor.

Plymouth Harbor.

For the security of this harbor a dike of riprap for the preservation of Long beach was extended 1,375 feet, being now 11,843 feet in length.

Provincetown Harbor.

Under the project to arrest the erosion and promote the accretion of the barrier of beach and sand dunes which preserves the harbor, the works of protection have been extended and repaired during the fiscal year as follows. At Long Point 1,093 tons of rubble stone were deposited, completing to the full cross-section 120 linear feet of new breakwater, and re-topping 65 feet of old breakwater. In the vicinity of Abel Hill dike 191 feet of double bulkhead, 420 feet of single bulkhead and 10,964 feet of sand-catches were built, and 906 feet of bulkhead and 1,800 feet of sand-catches repaired. At Wood End bulkhead 1,750 linear feet of sand-catches were built, and minor repairs made elsewhere.

Very respectfully,

W. S. STANTON,

Colonel, Corps of Engineers.

Statement of Lieut.-Col. J. H. Willard, Corps of Engineers, U. S. A., showing the work done by the United States on the rivers and harbors of Massachusetts under the Newport, R. I., engineer office, during the fiscal year ending June 30, 1905:—

Hyannis Harbor.

The work of dredging in the anchorage area protected by the breakwater, in progress at the beginning of the fiscal year, was completed Sept. 3, 1904. The amount of material removed under

the contract was 75,000 cubic yards. The total area to be deepened to 15.5 feet at mean low tide under the existing project for the improvement was 36 acres; of this, 34.5 acres have now been completed.

The river and harbor bill of March 3, 1905, appropriated \$80,000 for the improvement of the harbors of Hyannis and Nantucket; of this amount, \$10,000 was allotted for the completion of the project for the improvement of Hyannis harbor. A contract was entered into May 26, 1905, for dredging at both these harbors. The small amount of work at Hyannis harbor will be commenced about the time of the completion of the Nantucket work.

Nantucket Harbor.

The work under the contract of E. S. Belden & Sons of Hartford, Conn., for placing stone in the gap in the east jetty, in progress at the close of the last fiscal year, was completed July 21, 1904. Under this contract a total of 4,604 tons of stone were placed in the gap, by which it was filled to the level of mean low water.

The approved project for the expenditure of the \$70,000 allotted to this work from the appropriation of March 3, 1905, for the improvement of Hyannis and Nantucket harbors, provides for extending the eastern jetty about 1,200 feet, repairing portions of the jetty, and dredging a channel about 200 feet wide and 12 feet deep at mean low water through the bar between the jetties.

A contract was entered into with E. S. Belden & Sons of Hartford, Conn., for stone work in the jetty, at the rate of \$1.73 per ton, May 26, 1905. Work under this contract commenced June 5, 1905, and up to the close of the fiscal year 2,909½ tons of stone had been placed in the jetty.

Under date of May 26, 1905, a contract was entered into with the Morris & Cumings Dredging Company of New York for the dredging of the jetty channel, at the rate of 23.9 cents per cubic yard. The dredge commenced work June 23, 1905, and up to the close of the fiscal year 7,039 cubic yards had been dredged.

The breachway in the "Haulover" beach, separating the head of the harbor from the ocean on the eastern side of the island, has afforded an outlet for a large portion of the water which would otherwise have had to flow through the jetty channel. It is believed that the blocking up of the jetty entrance to the harbor by the jetties has contributed in no small degree to keeping the breach in the "Haulover" open. As it would be impracticable to close this breach by artificial means save at great expense, it was recommended that \$50,000 of the allotment for this work from the appropriation of March 3, 1905, be applied to dredging, partly with a view to increasing the water way

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through the jetty channel, and thereby assisting in closing the breach in the "Haulover."

Vineyard Haven.

No works of improvement were in progress during the fiscal year. Further work at this harbor is dependent upon the results of the examination of the Board of Engineers, convened in accordance with the river and harbor act of June 13, 1902, to consider the general subject of harbors in the waters of this locality.

Little Harbor, Woods Hole.

The river and harbor act of March 3, 1905, appropriated \$18,000 for dredging a channel 150 feet wide and 12 feet deep at mean low water from Vineyard Sound to the wharf of the lighthouse depot in Little Harbor, with a basin 300 feet wide and of the same depth in front of the wharf.

Under date of June 16, 1905, a contract was entered into with Charles M. Cole of Fall River, Mass., for doing this work, at the rate of 21 cents per cubic yard. The work of dredging was commenced June 26; and up to the close of the fiscal year 3,114 cubic yards of sand and gravel had been removed.

Woods Hole.

The river and harbor act of March 3, 1905, appropriated \$70,000 for the improvement of the channel leading from Woods Hole to Buzzards Bay, and authorized the expenditure of an additional \$100,000 for this work.

A project for the expenditure of the funds thus appropriated, contemplating the completion of the projected channel, had been approved, and specifications for the work had been prepared.

Weepecket Rock, Buzzards Bay.

This rock in Buzzards Bay off Uncatena Island, and in almost the direct line of travel from New Bedford to Woods Hole, in foggy weather, was a menace to vessels entering the Woods Hole strait from the Buzzards Bay end. Provision was made in the river and harbor bill of March 3, 1905, for its removal to a depth of about 10 feet.

Under date of June 5, 1905, a contract was entered into with Chas. E. Davis of New Bedford for the removal of this rock, for the lump sum of \$1,380. The removal was completed July 3, 1905.

New Bedford Harbor.

The river and harbor bill appropriated \$11,000 for dredging certain shoal areas along the wharf front both above and below

the new Fairhaven bridge, and cutting off the shoal spit extending northwardly from Fish Island.

Under date of May 31, 1905, a contract was entered into with Charles M. Cole of Fall River, Mass., for the proposed dredging, and the work was completed June 21, 1905. The total amount of mud and sand removed was 54,446 cubic yards.

Taunton River.

An appropriation of \$5,000 was made for the maintenance of the channel, which it was deemed desirable to retain until the season of 1906.

Fall River Harbor and Mount Hope Bay.

The work in progress at the beginning of the fiscal year, under the continuing contract with the J. S. Packard Dredging Company of Providence, R. I., for dredging a channel 300 feet wide and 25 feet deep at mean low tide in front of the city and across the flats in Mount Hope Bay, was continued until Sept. 6, 1904, when the work was completed. The total amount dredged under this contract was 1,091,462 cubic yards.

Removal of Wrecks.

The following wrecks were removed so as no longer to form obstructions to navigation: barkentine "Albertina," sunk on Chatham Bar; schooner "Viloa May," sunk on Shovelful Shoal; schooner "Frauline," sunk northeast of the northwest buoy on Common Flat, Chatham; schooner "Richard S. Leaming," sunk off Cross Rip Light Ship; schooner "Anna Laura," sunk 1¼ miles off Harding's beach, Chatham; steamship "Aransas," sunk in Pollock Rip Channel. The removal of the last-named wreck was in progress at the close of the fiscal year.

Preliminary Examinations and Surveys.

Provision was made in the river and harbor bill of March 3, 1905, for the examination of New Bedford harbor, with a view to obtaining additional anchorage grounds and increased depth.

APPROPRIATION FOR SURVEY AND IMPROVEMENT OF HARBORS.

By chapter 12 of the Acts of 1904 an appropriation of \$5,000 was made for surveys of harbors and for improving and preserving the same, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth.

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The following expenditures from this appropriation, in addition to those recited in the last report, were made in December, 1904, under the authority of section 9 of chapter 96 of the Revised Laws:—

Dredging southerly shore of South Boston,	\$60 00
Red River, Chatham,	10 00
Vineyard Haven harbor,	3 00
West Bay, Osterville,	111 45
Total,	<hr/> \$184 45

In 1905 the appropriation for the same purpose was \$5,000, from which sum expenditures have been made to December 1, in the localities and to the amounts following, viz.:—

Bass River, Yarmouth,	\$49 93
Charles River,	91 80
Connecticut River, West Springfield,	135 00
Cuttyhunk harbor,	32 95
East Bay, Osterville,	31 42
Herring River,	48 75
Lake Anthony,	25 00
Lewis Bay,	90 94
Nantucket harbor,	107 94
Paskamansett River,	92 15
Red River, Chatham,	20 25
Stage harbor, Chatham,	102 00
West Bay, Osterville,	120 75
Witchmere harbor,	404 00
Total,	<hr/> \$1,352 88

HARBOR COMPENSATION FUND.

There was paid into the treasury of the Commonwealth during the year, under chapter 146 of the Acts of 1897, and chapter 96 of the Revised Laws, for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of \$105,257.52, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1905, was \$529,506.91; the balance of income from this fund in the treasury on the same date was \$24,378.18; the total income for the year was \$20,482.28.

COMMONWEALTH'S FLATS IMPROVEMENT FUND.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1904, was \$1,315,014.67. To this has been added during the year \$44,348.12 from the income of the fund and \$28,305.90 from sales and rents of lands and other sources, making a total of \$1,387,668.69. Of this sum there has been expended during the year \$37,612.18, leaving a balance on Nov. 30, 1905, of \$1,350,056.51, subject to reduction for existing liabilities by reason of the anchorage basin contracts under chapter 476 of the Acts of 1901, and for contribution toward building Northern Avenue and bridge under section 4 of chapter 381 of the Acts of 1903.

The Board requests that a further appropriation be made out of this fund, to be expended in improvements upon the Commonwealth's flats at South Boston, and for work therewith connected.

The foregoing report is respectfully submitted.

WOODWARD EMERY,
GEORGE E. SMITH,
HENRY J. SKEFFINGTON,
Commissioners.

DEC. 1, 1905.

APPENDIX.

APPENDIX.

[A.]

[See page 4 of this report, *ante*.]

CONTRACTS.

The contracts entered into during the year are as follows:—

1904.		
Dec. 1.	With C. A. Callahan and J. J. Callahan, for strengthening with stone riprap the outer portion of the eastern jetty at Bass River, Yarmouth,— amounting to	\$4,578 98
1905.		
June 27.	With Joseph J. Callahan, for building dikes at the cut-through into Stage harbor, Chatham,— amounting to	7,143 81
July 26.	With the Eastern Dredging Company, for dredging in Fort Point Channel,— amounting to	4,119 16
July 27.	With Thomas & Connor, for building new channel at mouth of Herring River, in Harwich,— amounting to	11,141 02
July 28.	With Daniel O'Connell's Sons, for building dike on the Connecticut River, at Hatfield,— amounting to	1,445 13
Aug. 2.	With the Bay State Dredging Company, for dredging at Paskamansett River, Lewis Bay and Witchmere harbor,— amounting to about	9,650 00
Aug. 25.	With the Morris & Cumings Dredging Company, for dredging in Nantucket harbor,— amounting to	4,684 96
Aug. 25.	With William L. Miller, for building an extension to the concrete sea wall at Stony beach, Hull,— amounting to	2,728 82
Sept. 8.	With E. S. Belden & Sons, for building stone breakwater at Vineyard Haven harbor,— amounting to about	10,000 00
Sept. 15.	With William M. Swasey, for removing wreck of schooner "Annie E. Lane," at Beverly,— amounting to	250 00

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1905.

Sept. 28.	With Joseph J. Callahan, for building jetties at Cuttyhunk, — amounting to about	\$5,000 00
Oct. 30.	With the New England Dredging Company, for dredging between Savin Hill and Commercial Point, Dorchester, — amounting to about . . .	9,500 00
Nov. 20.	With the Eastern Dredging Company, for dredging in Fort Point Channel, in Boston harbor, — amounting to about	2,500 00
Total,		<hr/> \$72,741 88

[B.]

[See page 45 of this report, *ante*.]REPORT OF THE SUPERINTENDENT, PROVINCE
LANDS.

PROVINCETOWN, MASS., Nov. 30, 1906.

To the Board of Harbor and Land Commissioners.

GENTLEMEN:—In continuing the work on these lands, the same methods of treatment have been pursued as in previous years, namely, the transplanting of beach grass, trees and shrubs.

This season's work was commenced as soon as the ground was free from frost, about the first of April, and continued until the latter part of May, during which time the principal work was the transplanting of bayberry and young seedling pines. A considerable area of bayberry was planted, and about 20,000 seedling pines taken from the adjacent woods and bogs. Ninety per cent. of the bayberry lived and are doing well; but owing to the extreme drought which prevailed during the spring, only a small percentage of the seedling pines survive, while under favorable conditions of weather at least 80 per cent. should live and thrive.

Only 1 acre of grass was planted in the spring, as it has been demonstrated that the best results can be obtained from fall planting; therefore attention was given, until the latter part of May, to tree and shrub planting, and to keeping the roads through the lands in good condition for summer travel.

The work of transplanting beach grass was resumed in September, a portion of the force being thus engaged, and others employed in planting bayberry, the work being continued until the middle of November, covering during that time about 30 acres of the dunes, on a large part of which bayberry was planted.

On the outer range of sand dunes, where the work was started ten years ago, there has been a steady improvement from year to year; and it is reasonably certain that this range is permanently protected from any destructive forces, simply requiring protection from destructive human agencies in the future.

Of the many trees and shrubs which seem to be native to this section, some apparently spring up spontaneously where the sand is quiet; and in order to promote this growth, a great part of the

work has been the transplanting of beach grass for the purpose of holding the sands preparatory to the introduction of a more permanent plant growth, namely, trees and shrubs.

A total of about 270 acres has been covered with grass since work of this character was commenced, in the spring of 1895, and within this area there have been planted large quantities of trees and shrubs, the larger part being bayberry or wax myrtle (*Myrica cerifera*), which has proved to be a quick grower, making a solid and close covering.

Of the trees planted, the most valuable for this work are the three varieties of pine, namely, native pitch (*Pinus rigida*), Scotch (*Pinus sylvestris*) and Austrian (*Pinus Austriaca*), which make satisfactory growth, and are well adapted to this soil and climate.

Bound "A" was moved by the ice last winter, and has been re-set in a cement foundation of sufficient size to withstand any pressure from that cause in the future.

Respectfully submitted,

JAMES A. SMALL,
Superintendent of the Province Lands.

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TWENTY-EIGHTH ANNUAL REPORT

OF THE



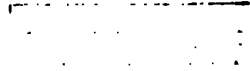
**BOARD OF HARBOR AND LAND
COMMISSIONERS.**

FOR THE YEAR 1906.



BOSTON :
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.

1907,



1909

1909

APPROVED BY
THE STATE BOARD OF PUBLICATION.

Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1906, covering a period of twelve months, from Nov. 30, 1905, being the twenty-eighth annual report of the Board since its establishment by chapter 263 of the Acts of 1879.

On July 25, 1906, the present organization of the Board was effected, as follows: George E. Smith, chairman, Henry J. Skeffington, Samuel M. Mansfield.

From Dec. 1, 1905, to Nov. 30, 1906, the Board has given 228 formal and informal hearings, and has received 170 petitions for license to build and maintain structures and for privileges in tide waters, great ponds and Connecticut River, to dredge material, to remove material from beaches, and for other purposes.

One hundred and sixteen licenses for structures and privileges in tide waters, great ponds and Connecticut River have been granted during the year; also 42 permits for dredging, for the removal of material from beaches, and for other purposes.

Thirty-five inspections have been made at various times by and under the direction of the Board, of work completed and in progress; of sites of authorized work, under appro-

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priations made by the Legislature; also upon petitions and plans presented to the Board of the sites of proposed work in tide waters; various structures built under licenses from the Board; sites of alleged dumping of material into tide waters, Connecticut River and great ponds; town boundary survey work, State boundaries.

Through transactions of the Board there has been paid into the treasury of the Commonwealth during the past year from rents, licenses, leases and other sources, and credited to the Commonwealth's flats improvement fund and the harbor compensation fund for Boston harbor, the aggregate sum of \$76,085.48.

During the year the Board made the following contracts, involving the estimated expenditure of \$121,872.53:—

1906.

Mar. 20.	With the Bay State Dredging Company, for dredging channel of Annisquam River in Gloucester, — amounting to about . . .	\$45,000 00
July 13.	With E. S. Belden and Sons, for extending stone breakwater at Apponagansett harbor in Dartmouth, — amounting to . . .	9,782 53
July 20.	With Thomas & Connor, for extending and repairing the stone jetty at Witchmere harbor, Harwichport, — amounting to about . . .	9,000 00
Aug. 8.	With George H. Cavanagh, for strengthening jetties, dredging channel and anchorage basin and riprapping their banks at Menamsha Inlet in the towns of Chilmark and Gay Head, — amounting to about . . .	24,690 00
Sept. 7.	With Jeremiah P. O'Riorden, for dredging in Ipswich River, — amounting to about . . .	4,500 00
Sept. 7.	With the Eastern Dredging Company, for dredging a channel and anchorage basin at Winthrop, — amounting to about . . .	4,800 00
Oct. 24.	With Thomas & Connor, for building stone and concrete sea walls at Scituate, — amounting to about . . .	10,000 00
Oct. 29.	With John T. Fitts, for building riprap at Third Cliff, Scituate, — amounting to about . . .	4,600 00
Nov. 20.	With Bay State Dredging Company, for dredging in Dorchester Bay between Savin Hill and Commercial Point, — amounting to about . . .	9,500 00

BOSTON HARBOR.

Petitions have been received during the year for the dredging by the Commonwealth of the channel of Mystic River above and below Malden bridge to a depth of from 12 to 18 feet at mean low water, and for dredging and widening the reserved channel at South Boston to accommodate the increasing volume of commerce.

Both of these water ways are worthy of improvement, but the Board has been unable thus far to make satisfactory contracts, in respect to price and date of completion of work, for dredging in these localities, by reason of the large amount of work of this character which is being done in the harbor and tributaries.

The Board has desired during the year to dredge an area between the Commonwealth pier and the line of the new 35-foot government channel to the northeasterly, and has been prevented by the fact that no dredges could be obtained without taking them from other work already contracted for by the United States or by the Commonwealth.

The Board has had occasion in the past to refer several times to what is termed "short or illegal dumping." The Secretary of War has established the dumping ground for dredged material northeast of a line drawn from Egg Rock to Minot's Ledge light. All contracts for dredging in Boston harbor and its tributaries, made by the United States or by the Commonwealth, to dump dredged material at sea, provide that the same shall be dumped at this locality; and every tug with scows filled with this dredged material towed to the dumping ground is accompanied by an inspector employed and paid by the United States or by the Commonwealth.

It is certain that there is a considerable amount of illegal dumping. The Board, when it issues a license or permit to private persons to dredge and dump at sea, has no express authority to require the licensee to take on board and pay for the services of an inspector employed by the State.

Maj. Edward Burr, Corps of Engineers, U. S. A., in charge of river and harbor work in this district, says that

“more or less of short or illegal dumping constantly occurs in Boston harbor.”

Legislation is respectfully recommended, authorizing this Board to supervise the transportation and dumping of all material dredged in Boston harbor and elsewhere in tide water in the Commonwealth.

Dredging operations by the Commonwealth during the year have been confined to the anchorage basin, a portion of Fort Point Channel, and two localities in Dorchester Bay, elsewhere alluded to in this report.

The original project of the Federal government for improving the channels of the harbor was adopted by Congress in 1867. The lower main ship channel below President Roads had then in places a width of only 150 feet, with a depth of 23 feet; and the upper main ship channel above President Roads had a least width of 100 feet and a least depth of 18 feet. Under the project of July 13, 1892, the government proposed to widen these channels to 1,000 feet, with a depth at mean low water of 27 feet.

In 1899 the project of making a new channel entrance to the harbor through Broad Sound, 30 feet deep and 1,200 feet wide, was adopted. That channel was completed Oct. 17, 1905, the lighthouse at its entrance, on the Graves, completing, with the range lights on Lovells Island for the seaward arm, and on Spectacle Island for the inner arm, the lighting of that channel.

The project of June 13, 1902, provided for channels 35 feet deep at mean low water, 1,200 feet wide from the Navy Yard at Charlestown and the Chelsea and Charles River bridges to President Roads, and 1,500 feet wide from President Roads through Broad Sound to the ocean.

Through the courtesy of Maj. Edward Burr, U. S. A., engineer in charge of the district, the Board is able to report the condition, Dec. 1, 1906, of work under the projects adopted by the Federal government and now under contract for the improvement of Boston harbor, as follows, viz.:—

(1) Project of July 13, 1892: The dredging has been completed, and also the rock excavation, except the removal

from the lower main ship channel of two small ledges containing 25 cubic yards and of one ledge containing 1,338 cubic yards in the upper main ship channel. Work on all of these ledges is now in progress, and their removal will probably be completed by Dec. 31, 1906, when no further work will be necessary under this project except that of maintenance of the depth obtained.

(2) Project of June 13, 1902: The contracts for dredging authorized by Congress are in force, and embrace the dredging of 9,780,000 cubic yards. On Dec. 1, 1906, 7,565,639 cubic yards had been dredged, and the rate of progress was 2.5 per cent. greater than that requisite to complete the dredging of the 9,780,000 cubic yards by Dec. 31, 1907, the time stipulated in the contracts, which will obtain a channel approximately 540 feet in width from the Navy Yard and the bridges to President Roads, and 685 feet thence to the sea. A continuous depth of 35 feet at mean low water had been obtained from the ocean to the Navy Yard and bridges; but the channels were not of navigable widths, and were obstructed by shoals and ledges.

A contract in force for the removal of ledges covering $2\frac{3}{4}$ acres, embracing 16,555 cubic yards, in the upper main ship channel off Governor's Island, is well advanced toward completion; and it is expected that a contract will be entered into early in 1907 which will include the removal of all other ledges obstructing the channels within the widths above stated.

It has been brought to the attention of the Board during the year that the new 30-foot government channel in Broad Sound is not used by pilots and navigators to the extent that it might be were it more fully buoyed. With a view to making this important channel available at all times, this subject has been taken up with the proper government officials.

ANCHORAGE.

By chapter 476 of the Acts of 1901, the Board was authorized to excavate a basin and to build and maintain structures in Boston harbor northerly of the main ship channel, for the purpose of providing mooring facilities and additional anchorage ground. The expenditure of \$1,000,000 was authorized

by this act, not more than one-fourth part to be expended in any one year.

In 1902 contracts were entered into for dredging along the northerly side of the main ship channel in the upper harbor an area about 1 mile in length and 1,000 feet in width, to a depth of 30 feet at mean low water; and, for the purpose of doing the work economically and expeditiously, the total area was divided into four sections of nearly equal areas and volume.

The contractors for this work are also engaged in the excavation of the main ship channel under the appropriations made by Congress, and it has seemed to the Board that the completion of this main channel was of paramount importance; therefore, it has refrained from forcing the contractors to complete the work on the anchorage basin within the time stated in the contracts.

The contracts, as originally let, provided that the work should be completed July 1, 1904. Subsequently, the time for the completion of the work on Section 2 was extended to April 1, 1905. During the past year the only work done was the excavation of 21,399 cubic yards from Section 1. The present condition of the work is shown by the following table: —

	Total Amount excavated to Dec. 1, 1906 (Cubic Yards).	Approximate Excavation to be made (Cubic Yards).
Section 1,	575,183	168,317
Section 2,	495,202	254,098
Section 3,	440,783	302,917
Section 4,	474,100	278,300
Totals,	1,985,268	1,003,632

A map showing the location of this anchorage basin was printed with the report of the Board for the year 1900.

Appropriations for this improvement have been made as follows: —

Chapter 97, Resolves of 1900,	\$2,500
Chapter 476, Acts of 1901,	1,000,000
<hr/>	
Total,	\$1,002,500

The amount expended during the year is \$3,104.83.

The total amount expended on this project to Dec. 1, 1906, is \$278,811.90.

DORCHESTER BAY.

The work of dredging anchorage basins in Dorchester Bay, off the southerly shore of South Boston, authorized by chapter 425 of the Acts of 1902, was completed March 31, 1906, under a contract entered into on Oct. 29, 1902, with the Eastern Dredging Company and the New England Dredging Company, jointly, at the price of 21 cents per cubic yard, measured in scows. The amount of excavation was 508,414 cubic yards.

The work accomplished is the dredging of two anchorage basins: one, known as the 6-foot area, located near the L Street bath-house and the club house of the Mosquito Fleet Yacht Club; the other and larger basin, known as the 9-foot area, near the public landing and the South Boston and Boston Yacht Club houses.

The appropriation for this work was as follows: —

Chapter 425, Acts of 1902,	\$100,000
--------------------------------------	-----------

The amount expended during the year is \$17,591.

The total amount expended on this project to Dec. 1, 1906, is \$100,239.96, a portion of which was paid from the appropriation for the survey and improvement of harbors.

DREDGING EASTERLY SHORE OF DORCHESTER.

In 1904 an anchorage basin 9 feet deep at mean low water, 350 feet wide and about 500 feet long, was dredged between Savin Hill and Commercial Point, Dorchester, in the flats adjoining the main channel of Neponset River, and the channel leading from that main channel to the wharves on the northerly side of Commercial Point enlarged, the channel being dredged to 12 feet at mean low water, 75 feet wide

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on the bottom and about 700 feet long, the total amount expended for this improvement to Dec. 1, 1904, being \$25,363.66.

The work of dredging a channel in Dorchester Bay on the northerly side of Commercial Point in extension of the channel dredged in 1904, which was in progress at the date of the last report of the Board under the appropriation made by chapter 453 of the Acts of 1905, was completed on May 4, 1906. In all, 40,298 cubic yards of material were excavated, at a cost, including the expense of surveys and supervision, of \$9,772.68.

A channel now extends from deep water opposite the wharf of the gas company at the end of Commercial Point to Doherty's wharf, a distance of about 1,900 feet; it is 75 feet wide on the bottom and 12 feet deep at mean low water. In addition, as part of the contract, a narrow cut, deep enough to float row boats at low water, was dredged from the excavated channel to the float of the public landing at Commercial Point.

By chapter 454 of the Acts of 1906, an additional appropriation of \$10,000 was made for dredging to a depth not exceeding 9 feet at mean low water in extension of the anchorage basin dredged in 1904; and on Nov. 20, 1906, a contract was entered into with the Bay State Dredging Company, the lowest bidder, for dredging to a depth of 9 feet at mean low water an area about 500 feet long and 400 feet wide, between the channel and anchorage basin dredged in 1903-04, the contract price being 27 $\frac{7}{8}$ cents per cubic yard.

Appropriations for work in this locality have been made as follows: —

Chapter 439, Acts of 1903,	. . . . .	\$25,000
Chapter 453, Acts of 1905,	. . . . .	10,000
Chapter 454, Acts of 1906,	. . . . .	10,000
Total,		<hr/> \$45,000

The amount expended during the year is \$8,792.15.

The total amount expended in this locality to Dec. 1, 1906, is \$35,151.34.

COMMONWEALTH FLATS AT SOUTH BOSTON.

The Commonwealth owns a large tract of filled land and flats at South Boston, commonly known as the South Boston flats, shown on the plan accompanying the annual report of the Board for 1903, and located both northerly and southerly of Summer Street, easterly of the freight yards of the New York, New Haven & Hartford Railroad, and having a long frontage on the main channel of Boston upper harbor and the reserved channel.

The area northerly of Summer Street is 4,317,234 square feet, or 99.1 acres, exclusive of pile piers, but including the filled portion of the Commonwealth pier, 4,662,234 square feet, or 107.2 acres; of this area, 792,287 square feet, or 18.2 acres, is under lease. The area southerly of Summer Street, exclusive of streets, is 1,917,347 square feet, or 44 acres; of which 88,221 square feet, or 2 acres, is under lease, and 304,560 square feet, together with 47,000 square feet in two cross streets, or 8.1 acres in all, is used temporarily as a public playground, under authority of chapter 421 of the Acts of 1891.

On May 10, 1906, the lease from the Commonwealth to the Metropolitan Coal Company of land and pier, originally made to Lamont G. Burnham for a term of fifteen years from April 1, 1897, and subsequently assigned to said company, was extended to April 1, 1921.

No contracts for extensions or improvements have been in force, and no new sales or leases of these lands made, during the year. Early in 1906 it was found that a portion of the bulkhead enclosing the filling near the wharves of the Metropolitan Coal Company and the Curran & Burton Coal Company had become so weakened by worms that the filling was escaping. These bulkheads were repaired by placing additional planking, at an expense of \$203.98.

The bulkhead extending from the Commonwealth pier to the wharf of the Boston Molasses Company was built in 1889 and 1891, and is now quite weak in many places from decay and the action of sea-worms. Small repairs similar to those done the past year are now needed; but these will be tempo-

rary, and extensive rebuilding will be necessary within a few years to protect the filling.

The Metropolitan Coal Company and other tenants of the Commonwealth having applied for permission to construct a railroad track from their premises to the tracks of the New York, New Haven & Hartford Railroad, for the purpose of shipping coal and other goods, a study of the proper development of the property with railroad tracks was made; and on April 2, 1906, a license¹ was issued to the railroad company to lay, maintain and operate railroad tracks across the area lying between Summer Street and the head of the docks, crossing the northerly ends of the premises leased to the Curran & Burton Coal Company, the Metropolitan Coal Company and the Boston Molasses Company. A track has been laid, and is so located that it can be used for connecting with tracks to other portions of the property and to the wharves and piers.

For many years an opportunity has been given to contractors for excavating material in the city to dump the same on these lands; but, as the portions of the flats already enclosed have become filled, this privilege has been restricted, so that now only engine ashes, brickbats, sand, gravel and similar dry material are allowed to be dumped there, this material being used to form a coating over the clay filling taken from the harbor.

During the year the city of Boston has paved C Street from First Street to Fargo Street, where it connects with the paving previously done in connection with the construction of Summer Street; and the New York, New Haven & Hartford Railroad Company has developed, by tracks and warehouses, the territory lying between B and C streets.

In connection with this work, it has paved about 160 feet in length of Anchor Street, adjoining C Street; and, as the abutting land on the southerly side of the street belongs to the Commonwealth, the Board has agreed that the Commonwealth should pay one-half the cost. The sewers and drains have been cleaned and kept in order, and the streets and fences given such incidental repairs as were needed.

COMMONWEALTH PIER.

Under authority of chapter 513 of the Acts of 1897, the Commonwealth built a pier on its property at South Boston, 1,200 feet long and 400 feet wide, with a dock on the westerly side 175 feet wide at the outer end, 200 feet at the inner end and 30 feet deep at mean low water. There is also a berth at the outer end of this pier, having the same depth as the dock.

The sum of \$122 has been collected and paid into the treasury of the Commonwealth during the year, for the use by vessels of the dock on the westerly side of the pier and the berth at the end of said pier.

The appropriation for this pier was as follows: —

Chapter 513, Acts of 1897,	\$400,000
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The total cost of this pier to Dec. 1, 1906, is \$381,877.09.

NORTHERN AVENUE AND BRIDGE.

Under the provisions of chapter 381 of the Acts of 1903, authorizing the laying out and construction of Northern Avenue and bridge across Fort Point Channel and the land of the New England Railroad Company, the Boston Wharf Company and of the Commonwealth at South Boston, the State is required to pay to the city of Boston from time to time, as the work progresses, upon the order of this Board, the sum of \$260,000.

The Board is informed that two of the masonry piers of this bridge in the channel are finished, and that the concrete for the third pier is now ready for the stone work. The foundation for the center draw pier is in place, and the timber guard pier is completed with the exception of a small amount of planking and some low water braces. The stone work of the abutment at the Boston end of the bridge is built and part of the concrete flooring back of the abutment is in place. It is probable that this concrete work will not be finished until next spring, as the weather conditions will not permit any more to be put in this winter.

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It is anticipated that all the work under contract for the unfinished abutment and pier will be completed April 1, 1907.

Proposals for the steel superstructure will soon be invited.

A preliminary map showing Northern Avenue and bridge was printed with the report of the Board for the year 1901.

Under the provisions of chapter 381 aforesaid, the Commonwealth has paid to the city of Boston, to Dec. 1, 1906, the total amount of \$200,000.

THE COMMONWEALTH'S FLATS AT EAST BOSTON.

This tract of flats is located at and near Jeffries Point in East Boston, and was acquired by the Commonwealth under authority of chapter 486 of the Acts of 1897.

The question involving the title of the East Boston Company, the largest owner, to certain of these flats acquired as aforesaid, is still pending in the Land Court, under the charge of the Attorney-General.

The appropriation for the acquirement of these flats was as follows:—

Chapter 486, Acts of 1897,	\$100,000
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The total amount expended on account of this property to Dec. 1, 1906, is \$25,138.79.

FORT POINT CHANNEL.

The dredging of an area of 52,000 square feet between Mount Washington Avenue and Federal Street bridges, to a depth of 16 feet at mean low water, under a contract between the Commonwealth and the Eastern Dredging Company, dated Nov. 20, 1905, was completed Jan. 6, 1906. The contract price was 29 cents per cubic yard; and the total cost of the work, \$2,277.25, was paid from the income of the harbor compensation fund.

The Board is informed that the government has entered into a contract for dredging to the depth of 23 feet a portion of this channel of a general width of 175 feet from a point

about opposite Rowe's wharf to the draw pier of the Dorchester Avenue bridge.

Nothing has been done up to Dec. 1, 1906.

SOUTH BAY.

Nothing has been done during the year under a contract entered into with the Roxbury Central Wharf Company, April 8, 1904, for dredging a channel across the southerly end of the bay, in extension of the channel dredged by the Commonwealth in 1902. The total amount expended from the "Improvement of South Bay in the city of Boston fund," created by chapter 278 of the Acts of 1898, to Dec. 1, 1906, is \$49,341.24. The balance in this fund Nov. 30, 1906, was \$10,096.26.

On April 24, 1906, the Board, acting under authority of chapter 484 of the Acts of 1901, certified that the purchase and acquisition by the South Bay Wharf and Terminal Company of about 780,000 square feet of land on Massachusetts Avenue and Southampton Street in the city of Boston, shown on plan filed with the petition of said company to this Board, were reasonably necessary and convenient for the purposes of said act of 1901.

WINTHROP HARBOR.

By chapter 91 of the Resolves of 1906, the Board was directed to dredge and improve the channel in Winthrop harbor which extends from the main Winthrop Channel from a point nearly opposite Apple Island in a northeasterly direction about 1,500 feet to the pier of the Cottage Park Yacht Club, and the basin around said pier, the depth not to exceed 8 feet at mean low water.

The necessary surveys having been made and releases obtained from owners of flats, a contract was entered into on Sept. 7, 1906, with the Eastern Dredging Company, the lowest bidder, to widen the present channel leading to the anchorage near the wharf of the Cottage Park Yacht Club, and to enlarge and deepen that anchorage basin so that the channel shall be 100 feet wide on the bottom and the basin

about 200 feet by 550 feet on the bottom, the channel and basin to be not less than 6 feet deep at mean low water; the contract price being $22\frac{7}{8}$ cents per cubic yard, measured in scows, the work to be completed by Nov. 30, 1906. Work under this contract has not been commenced.

The appropriation for this improvement was as follows:—

Chapter 91, Resolves of 1906, \$6,525

The amount expended for survey in connection with this improvement to Dec. 1, 1906, is \$91.60.

SHIRLEY GUT.

Early in the year a survey was made of Shirley Gut, and it was found that the point at the end of Point Shirley had built out so that the dimensions of the channel had been reduced to about one-half of what they were at the time the last dredging was done, two years before. Applications have been made by various parties for permission to dredge gravel from the Gut, and permits have been issued requiring a certain proportion of the material excavated to be taken from the extreme end of the Point, in order to restore the channel to the dimensions which existed two years earlier. Under these permits, and without expense to the Commonwealth other than the cost of inspection, the channel at the end of the Point was wholly dredged to its original dimensions early in June, 1906, and considerable quantities of gravel have since been dredged from the bar at the outer entrance to the channel and along its banks. This gravel is largely used for concrete in the construction of the Charles River dam and other public works.

Inspection was necessary to see that the work was properly carried out without injury to the sewer and water pipes crossing the Gut at this place. The total amount expended for the maintenance of this channel to Dec. 1, 1906, is \$1,906.20.

REVERE BREAKWATER.

By chapter 108 of the Resolves of 1905, the Board was instructed to build a breakwater north of Cherry Island bar and east of Eliot Circle in the town of Revere, of such size and character as to provide a safe anchorage for yachts and to protect the shore property from damage by the sea.

This resolve provided that any expense necessary for the complete construction of a breakwater after the expenditure of the money appropriated (\$25,000) should be incurred and borne by the town of Revere or the citizens thereof. The estimated cost of a breakwater in this locality, if built in accordance with plans prepared by the Board, exceeded the appropriation by \$30,000; and, as stated in the report for 1905, the Board felt unauthorized to expend any of the appropriation unless it was sure of being able to fulfill the intent of the Legislature to secure the completion of a project toward which it intended to apply only \$25,000.

By chapter 99 of the Resolves of 1906, the Board was authorized to expend a sum not exceeding \$30,000, in addition to the sum of \$25,000 authorized by the resolve of 1905. Of this additional sum of \$30,000 there may be expended in each of the years 1907-08-09 the sum of \$10,000, provided that no portion of the money provided for in the resolves of 1905 and 1906 shall be expended until the town of Revere shall have furnished satisfactory evidence to this Board that it will provide, free of charge to the Commonwealth, within one year after the completion of the breakwater, a public landing place within the area protected by the breakwater.

On Oct. 8, 1906, a vote was passed by the town of Revere which was accepted by this Board as satisfactory evidence that it will provide a public landing place, as required by the resolve of 1906.

The project adopted is the construction of a breakwater located to afford protection of an anchorage area 600 by 900 feet, having a depth of over 6 feet at mean low water, with protection to shore property from damage by the sea.

Proposals for the construction of this breakwater will be

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invited after the necessary releases from property owners are obtained.

Appropriations for this breakwater have been made as follows:—

Chapter 108, Resolves of 1905,	\$25,000
Chapter 99, Resolves of 1906,	30,000
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Total,	\$55,000

No expenditures have been made.

ANNISQUAM RIVER.

The improvement of a portion of this river was authorized by chapter 88 of the Resolves of 1904, which provided for the excavation of a channel 50 feet wide and 6 feet deep at mean low water, from Wolf Hill to Gloucester harbor, in accordance with a plan prepared by the Board under the provisions of chapter 71 of the Resolves of 1903, at an expense of not more than \$50,000 during the period of three years next ensuing the passage of this resolve; of which sum not more than \$17,000 shall be expended in any one year.

The necessary releases having been obtained from property owners, and plans and specifications approved for the new bridge at Western Avenue to be built by the county commissioners of Essex County over the "canal" at the southerly end of the proposed channel, a contract was entered into on March 20, 1906, with the Bay State Dredging Company, the lowest bidder, to excavate the channel and make the necessary changes in the walls near the Western Avenue bridge, the contract prices being as follows: for excavating a portion of the channel in the "canal" and depositing the material on the banks of the "canal," \$8,985; for excavating the balance of the channel and disposing of the material not otherwise provided for, the following sums: for material dumped at sea, and for material deposited on the shores or flats of this river, 32 cents per cubic yard, measured in scows; for building sea wall on the easterly bank of the new channel near Western Avenue of stone obtained from old walls, \$1 per cubic yard of wall built; for building sea wall

on easterly bank of new channel near Western Avenue of new stone, \$5 per cubic yard of wall built; for furnishing and depositing in place chip stone for ballast in rear of sea wall, and for furnishing and placing chip stone in front of sea walls and on the banks of the "canal," 30 cents per ton; for back filling, 50 cents per cubic yard, measured in fill.

Up to Dec. 1, 1906, 88,277 cubic yards have been excavated and 124.4 feet of sea wall built on the easterly side of the "canal" south of Western Avenue. It is expected that the whole work will be completed early in 1907.

A map of this river was printed with the report of the Board for the year 1903.

Appropriations relating to this work have been made as follows:—

Chapter 71, Resolves of 1903,	\$1,500
Chapter 88, Resolves of 1904,	50,000
	<hr/>
Total,	\$51,500

The amount expended during the year is \$33,409.41.

The total amount expended for the improvement of this river to Dec. 1, 1906, is \$34,808.69.

IPSWICH RIVER.

By chapter 473 of the Acts of 1906, the Board was directed to deepen and improve the channel of Ipswich River, and authorized to expend a sum not exceeding \$5,000 therefor.

A survey was made in July, 1906, and a project for the improvement, by dredging, of such portions of this river as are possible within the limits of the appropriation, was adopted.

The dredging provided for will greatly facilitate navigation; but the appropriation is insufficient to cover any work at Barras Banks, so called, where the channel makes two sharp bends, or at the rocks above, one or two of which project near the level of low water.

On Sept. 7, 1906, a contract was entered into with Jeremiah P. O'Riorden of Boston, Mass., the lowest bidder, to dredge channels through three shoals or bars in this river, as

follows: (1) at the inner bar at the mouth of the river, 600 feet long, 100 feet wide on the bottom and 6 feet deep at mean low water; (2) opposite the mouth of Neck Creek, 500 feet long, 60 feet wide on the bottom and 5 feet deep at mean low water; (3) from Horseshoe curve to the southerly end of Old Maid's bank, about 1,900 feet long, generally 60 feet wide on the bottom and 5 feet deep at mean low water. The amount of material to be removed is estimated to be about 13,100 cubic yards, situ measurement; and the contract price is $28\frac{9}{10}$ cents per cubic yard, measured in scows.

The contract provides that the dredging shall be completed by Dec. 31, 1906. Work is to be commenced early in December, 1906.

The appropriation for dredging this river was as follows: —

Chapter 473, Acts of 1906, \$5,000

The amount expended for survey to Dec. 1, 1906, is \$145.32.

SCITUATE.

The shores and harbor of the town of Scituate have been improved and protected by work done under direction of this Board and paid for by the Commonwealth, as follows: —

In 1900 a concrete sea wall, 998 feet in length, was built along the crest of the narrow beach at the Sand Hills between Scituate harbor and the ocean, at a cost of \$5,408.05.

In 1902 a concrete sea wall, 1,450 feet in length, was built along the crest of the beach located between Damons Island and The Glades at North Scituate, at a cost of \$8,345.35, of which \$2,000 was paid for land damages.

By chapter 496 of the Acts of 1906, the Board was authorized and directed to build a granite wall along Beach Street, where it borders upon the sea, at an expense not exceeding \$4,000; a concrete wall in extension of the present wall near Surfside Road, at an expense not exceeding \$3,000; a concrete wall between the First and Second cliffs, at an expense not exceeding \$3,800; and a jetty, sea wall or breakwater at the southerly end of the Third Cliff, at an expense not ex-

ceeding \$5,000. The Board was authorized to expend for the purposes above named a sum not exceeding \$15,800.

After making the necessary examination and surveys, a contract was entered into on Oct. 24, 1906, with Thomas & Connor, of Middleborough, Mass., the lowest bidder, to build three sea walls, one to be of granite masonry to replace the timber bulkhead forming part of the retaining wall along the easterly side of the highway passing in front of the Cliff House at North Scituate, the other two to be concrete walls; one of these, near Surfside Road, to be built in extension, southerly, of the wall in front of the life-saving station at North Scituate, the other to be built along the northerly portion of the beach between the First and Second cliffs at Scituate harbor. The contract prices are as follows: for granite wall, \$9.25 per linear foot; for concrete wall at North Scituate, \$7.50 per linear foot; for concrete wall at Scituate harbor, between the First and Second cliffs, \$4.75 per linear foot; for riprap placed in front of concrete wall, between the First and Second cliffs, \$1.50 per cubic yard. All work is required to be completed not later than June 1, 1907. The contractor is at work quarrying stone for the granite wall, and has completed 131 feet in length of the concrete wall near Surfside Road. Nothing has been done on the wall between the First and Second cliffs. Under the terms of the contract, no masonry work is to be done between Dec. 1, 1906, and April 1, 1907, so that all work is now suspended except the quarrying of stone.

On Oct. 29, 1906, a contract was entered into with John T. Fitts of Scituate, Mass., the lowest bidder, for building a stone riprap protection for the bluff at the southerly end of the Third Cliff, the section to be protected extending northerly from the southerly end of the cliff about 1,000 feet. The contract price is \$2.10 per ton, the work to be completed by Feb. 1, 1907. The contractor has furnished and delivered on the top of the cliff 1,097 tons of stone, but has not as yet placed any of it at the foot of the cliff. The work of placing the stone is to be commenced shortly, as soon as sufficient stone is delivered to make sure that the plant for placing the stone will be kept continuously at work.

low water and a width of 250 feet. For the inner portion of the channel one is based on the same depth and width, and the other on a depth of 18 feet at mean low water and a width of 200 feet.

The turning basin at the inner end of either channel is to be triangular in shape, 610 feet in length, on a line parallel with and 60 feet distant from the face of the proposed wharf of the Cordage Company, with the side lines converging to the width of the channel in a distance of about 500 feet.

In the second estimate the larger width and depth are retained for the portion of the channel across the bar, as, owing to the heavier seas to which this bar is exposed, a greater actual depth is needed to give the same navigable depth as in the inner portion of the channel, where there is less sea. The greatly increased amount of excavation which would be required for getting a depth of 22 feet through this bar did not seem warranted, in view of the fact that in special cases the passage of large vessels through this channel could be delayed until the weather conditions were more favorable.

The estimates are as follows:—

For a channel 250 feet wide and 20 feet deep throughout at mean low tide, from the Cow Yard to the wharf:—

Channel through bar, 20 feet deep and 250 feet wide,	
50,000 cubic yards (scow measurement), at 25 cents,	\$12,500 00
Inner portion, 20 feet deep and 250 feet wide, 840,000	
cubic yards (scow measurement), at 25 cents, . . .	210,000 00
Turning basin, 135,000 cubic yards (scow measurement),	
at 25 cents,	33,750 00
Supervision and incidental expenses,	11,000 00
Total,	\$267,250 00

For a channel 250 feet wide and 20 feet deep through the bar at the Cow Yard, and 18 feet deep and 200 feet wide for the remaining distance to the wharf:—

Channel through the bar, 20 feet deep and 250 feet wide,	
50,000 cubic yards (scow measurement), at 25 cents,	\$12,500 00
Inner portion, 18 feet deep and 200 feet wide, 570,000	
cubic yards (scow measurement), at 25 cents, . . .	142,500 00
Turning basin, 120,000 cubic yards (scow measurement),	
at 25 cents,	30,000 00
Supervision and incidental expenses,	8,000 00
Total,	\$193,000 00

Respectfully submitted,

FRANK W. HODGDON,
Chief Engineer.

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The amount expended from the appropriation of \$400 made by chapter 95 of the Resolves of 1906, to Dec. 1, 1906, is \$397.74. In addition to this amount, \$8 was paid from the appropriation for the survey and improvement of harbors.

BASS RIVER, YARMOUTH.

The entrance to this river has been improved by the Commonwealth, beginning in the year 1902, by constructing jetties and by dredging, the total amount expended therefor to Dec. 1, 1905, being \$37,129.68.

In May, 1906, a survey was made of the mouth of the river, between Dennis and Yarmouth, and it was found that the channel had improved considerably since the survey of the previous year. While the navigable depth had not materially increased, yet the depth of water over the bar in line with the main portion of the channel had increased, while the width of the bar was less than one-half what it was the previous year.

The stone riprap which was placed two years ago to protect the outer portion of the easterly jetty is in good condition; but for a distance of about 500 feet inside of the stone work the worms have eaten through the planking of the jetty, and it will not be long before additional riprap should be placed to protect the inner portion of this jetty, in order to prevent large volumes of water flowing through it, thereby reducing the volume and scouring force of the current over the bar in the main channel.

Appropriations for this river have been made as follows: —

Chapter 39, Resolves of 1901.	\$500
Chapter 113, Resolves of 1901,	22,000
Chapter 46, Resolves of 1903,	15,000
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Total,	\$37,500

The amount expended during the year is \$172.35.

The total amount expended in improving the entrance to this river to Dec. 1, 1906, is \$37,302.03.

LEWIS BAY.

This bay, in the towns of Barnstable and Yarmouth, was improved in 1900 by dredging the channel leading to the wharves in the inner bay to a depth of 6 feet at mean low water.

The work of dredging a channel across the bar in the eastern end of the bay, authorized by chapter 395 of the Acts of 1905, appropriating \$3,000 therefor, was completed Dec. 5, 1905, under contract with the Bay State Dredging Company dated Aug. 2, 1905, at a cost, including surveys and superintendence, of \$3,740.94, a portion of which was paid from the appropriation for the survey and improvement of harbors.

A map of this bay was printed with the report of the Board for the year 1899.

Appropriations relating to Lewis Bay have been made as follows: —

Chapter 96, Resolves of 1899,	\$1,500 ¹
Chapter 194, Acts of 1900,	12,500
Chapter 395, Acts of 1905,	3,000
	<hr/>
Total,	\$17,000

The amount expended during the year is \$3,692.50.

The total amount expended for the improvement of Lewis Bay to Dec. 1, 1906, is \$17,012.22, a portion of which was paid from the appropriation for the survey and improvement of harbors.

HERRING RIVER.

The mouth of this river, in the town of Harwich, was improved in 1905 by the construction of a new entrance through the beach to the west of the old entrance, protecting the banks of the cut with stone riprap and building two stone jetties — one on either side of the new entrance. The excavation

¹ Including Witchmere harbor and East Bay, Osterville.

through the beach was carried down to the plane of mean low water, with the expectation that the current of the river would scour out a channel, at least as wide and deep as the old one. To close the old outlet, an embankment of sand was built across it, thereby directing all the current through the new entrance.

The sum of \$10,000 was appropriated for the work by chapter 399 of the Acts of 1905, with the proviso that at least \$2,000 should be contributed and paid into the treasury of the Commonwealth by the town of Harwich or its citizens before any portion of the State appropriation was expended. The amount of \$2,000 was contributed and paid into the treasury, as required by the statute.

In May, 1906, a survey was made, and the jetties built in 1905 were found to be in good condition. The channel had scoured so that it had a depth of not less than $1\frac{1}{2}$ feet throughout its length and over the bar, at mean low water. The sea had formed a beach across the old outlet, but this had been pushed back just east of the point where the riprap ended, to such an extent that the people living in the vicinity were afraid that it would break through and divert the current from the new outlet. To prevent this, they constructed a timber fence along the crest of the beach with one projecting timber spur, and deposited a considerable quantity of stone riprap along the face of the beach. They reported an expenditure of about \$1,800 for this work. During the summer request was made that an additional amount of riprap be placed there, to more effectually secure the beach; and in September, 1906, about 200 tons of stone were deposited as riprap on the beach east of the easterly jetty. This stone was taken from the back side of the westerly jetty at its inner end, where the beach had filled in against it so that the stone could be removed without weakening the structure. Two short timber spurs were built to catch the sand and build up the beach at its weakest point. The total cost of this work was \$260.20.

A map of a portion of this river was printed with the report of the Board for the year 1901.

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Appropriations relating to this river have been made as follows:—

Chapter 66, Resolves of 1901,	\$500
Chapter 399, Acts of 1905,	10,000
By the town of Harwich,	2,000
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Total,	\$12,500

The amount expended during the year is \$2,143.95.

The total amount expended in connection with the improvement of this river to Dec. 1, 1906, is \$12,440.22.

WITCHMERE HARBOR.

This harbor, located at Harwichport, has been improved by the construction of jetties and by dredging done in the years 1899, 1900, 1901 and 1905, at a total cost, to Dec. 1, 1905, of \$8,823.96.

The Board recommended in its report for 1905 that the stone jetty extended in 1899 be extended about 300 feet further, and estimated the cost to be about \$10,000.

By chapter 441 of the Acts of 1906, the Board was authorized to complete the improvements already begun in this harbor by extending the jetties therein, and by such other work as may be necessary to make the harbor safe and convenient, and to expend for this purpose not exceeding \$10,000.

On July 20, 1906, the Board entered into a contract with Thomas & Connor of Middleborough, Mass., the lowest bidder, for extending the existing stone jetty on the westerly side of the entrance to the harbor, and for repairing the existing jetty, the contract prices being as follows: for large stone furnished and placed in the jetty, \$2.59 per ton; for small stone furnished and placed in the jetty, \$2.59 per ton; for removing and replacing such stone now in the back of the existing jetty as may be required in order to place a core of small stones in the jetty, \$100.

The work was commenced in August, but owing to delays in the delivery of stone it has not as yet been completed. Up

to Dec. 1, 1906, 2,461 tons of stone have been placed in the jetty, and work has been suspended for the winter. The contractor proposes to resume work as soon as the weather is suitable in the spring, and it will then be completed before the opening of the yachting season. The work done thus far protects the channel dredged in 1905.

Appropriations for this harbor have been made as follows:—

Chapter 96, Resolves of 1899,	\$1,500 ¹
Chapter 91, Resolves of 1904,	3,500
Chapter 441, Acts of 1906,	10,000
By the town of Harwich,	500
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Total,	\$15,500

The amount expended during the year is \$6,830.33.

The total amount expended for the improvement of this harbor to Dec. 1, 1906, is \$15,654.29, a portion of which was paid from the appropriation for the survey and improvement of harbors.

EAST BAY, OSTERVILLE.

The work of improvement at East Bay, Osterville, done under authority of chapter 376 of the Acts of 1903, comprised a channel excavated through the beach from the bay to Nantucket Sound protected by two stone jetties, with a temporary dam to close the old outlet of the bay, all of which was completed in May, 1904.

In December, 1905, a strip of beach 150 feet in length, where the sea had cut into the shore to the east of the easterly jetty and was liable to break through the narrow beach, was protected by a riprap of stone taken from the outer end of the easterly jetty, about 40 feet in length of the outer end of that jetty being used for this purpose. At the same time, to replace the temporary sandbag dam built in 1904 to close the old outlet, and which had broken away, a dike of sand was thrown up across the inner end of the old entrance, effectually closing it. Since the construction of the sand

¹ Including Lewis Bay and East Bay, Osterville.

dike the sea has thrown up a beach across the outer end of the old outlet, more effectually closing it. The cost of this dike and riprap was \$850.

In May, 1906, a survey was made of the entrance, and it was found that the channel over the bar had deepened, the improvement being probably largely due to the closing of the old entrance during the previous fall. The riprap placed on the beach east of the easterly jetty thoroughly protects the portion covered by it, but it was apparent that the adjoining beach to the east was being rapidly cut away by the sea. In order to protect this section, 301.2 tons of field stone were purchased and placed on the face of the beach, covering it in the same manner as the other portion of the beach had been covered. This work was done at a cost, including supervision, of \$1,104.23.

This harbor was very largely used by yachtsmen during last summer.

A map of East Bay was printed with the report of the Board for the year 1899.

Appropriations relating to this bay have been made as follows:—

Chapter 96, Resolves of 1899,	\$1,500 ¹
Chapter 376, Acts of 1903,	6,500
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Total,	\$8,000

The amount expended during the year is \$2,025.73.

The total amount expended at East Bay to Dec. 1, 1906, is \$8,675.25, a portion of which was paid from the appropriation for the survey and improvement of harbors.

WEST BAY, OSTERVILLE.

The Commonwealth has excavated a channel through the beach between West Bay and Nantucket Sound and built jetties at Osterville in the town of Barnstable, beginning in the year 1898.

From a survey of the entrance, made in May, 1906, it appears that the channel is deeper and better than it was in

¹ Including Witchmere harbor and Lewis Bay.

the previous year. The timber work of the jetty was in fair condition after the repairs made during the previous fall.

A map showing West Bay was printed with the report of the Board for the year 1897.

Appropriations for this locality have been made as follows: —

Chapter 483, Acts of 1897,	\$8,500
Chapter 440, Acts of 1898,	7,500
Chapter 491, Acts of 1902,	7,500
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Total,	\$23,500

The amount expended during the year is \$69.87.

The total amount expended at West Bay to Dec. 1, 1906, is \$29,355.51, a portion of which was paid from the appropriation for the survey and improvement of harbors.

DEACON'S POND, FALMOUTH.

By chapter 461 of the Acts of 1906, the Board was authorized to make such examination and survey as may be found necessary of Deacon's Pond in Falmouth and the beach between it and Nantucket Sound, to determine the feasibility and cost of cutting a channel through said beach, protecting the same with jetties and riprap, and reopening a part of said pond to form a harbor for boats and yachts having a draft of not less than 6 feet; and if it is found to be practicable to build such harbor, the Board is directed to proceed forthwith to construct the same. This act further authorized the expenditure by the Commonwealth during 1906 and 1907 of \$25,000 in addition to the amount paid into the treasury of the Commonwealth by the town of Falmouth; provided, however, that not more than \$15,000 in addition to the amount paid by said town shall be expended during the year 1906. Section 5 of this act provides that the work of construction shall not be commenced until \$10,000 shall have been paid into the treasury of the Commonwealth in accordance with the provisions of chapter 69 of the Acts of 1906. The town of Falmouth has voted to appropriate \$10,000 for this improvement, in accordance with

chapter 69 aforesaid, but the amount has not as yet been paid into the State treasury.

Surveys have been made, and the following project, comprising dredging a portion of the pond and the outlet into Vineyard Sound and the construction of two stone jetties, has been considered. The jetties are to be 5 feet wide on top, with side slopes of 1 on $1\frac{1}{2}$, and are to extend from the crest of the beach into the sound, the westerly one to be 325 feet long and the easterly one 175 feet long. The entrance channel and basin in the pond are to be dredged to 7 feet at mean low water; the entrance channel to be 100 feet wide on the bottom, and the basin to extend from shore to shore for a distance of about 500 feet northerly of the present road across the pond. The dredging will cover an area of about $5\frac{3}{4}$ acres. The estimated cost of the jetties and dredging is \$34,900, based on the assumption that the town of Falmouth will discontinue the roadway now built across the pond as a public highway, and that releases from any claim for damage will be obtained from the owners of property along the shore of the pond and on the beach through which the entrance would be excavated.

In October, 1906, the Board determined that it is practicable to build such harbor, and communicated with the town, through its committee; and is now awaiting the receipt of certain releases from owners of land and action by the town in respect to the highway across said pond before final adoption of the project and advertising for proposals.

Appropriations relating to Deacon's Pond have been made as follows:—

Chapter 461, Acts of 1906,	\$25,000
By the town of Falmouth,	10,000
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Total,	\$35,000

The total amount expended in connection with this project during the year is \$7.

WEST FALMOUTH HARBOR.

Pursuant to chapter 31 of the Resolves of 1906, directing the Board to make a survey of the channel of the harbor of West Falmouth and report thereon to the General Court, with estimates of cost of dredging the channel to such depth and width as the Board may deem advisable, a report (House, No. 1198) was made April 11, 1906.

The sum of \$191.67 was expended from the appropriation of \$500 made by this resolve.

APPONAGANSETT HARBOR.

Under authority of chapter 509 of the Acts of 1902, the harbor at Apponagansett in the town of Dartmouth was improved by the construction in 1902 and 1903 of a stone breakwater at its entrance, 690 feet long, beginning at a point about 250 feet from the high-water line, where there was a depth of about 4 feet at mean low water, in order to allow small boats to pass near the shore. The contract price was \$1.07 per ton of stone placed in the work. This structure provided a safe anchorage for yachts and other small craft, and the use of the harbor was increased.

By chapter 443 of the Acts of 1906, the Board was authorized and directed to expend in its discretion not exceeding \$10,000 for improving this harbor by extending this breakwater; and on July 13, 1906, a contract was entered into with E. S. Belden & Sons, the lowest bidder, to extend this breakwater, the contract price being \$1.23 per ton for all stone furnished and placed in the breakwater. This work was completed Nov. 4, 1906, 140 feet having been added, so that the breakwater is now 830 feet long. In addition, four beacons have been built on the breakwater, one at each end and two placed at equal distances between them. The beacons built on the original breakwater were washed down by the sea; and, in order to protect the new ones, they have been bound together with iron clamps.

A map of this harbor was printed with the report of the Board for the year 1901.

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Appropriations for this harbor have been made as follows:—

Chapter 38. Resolves of 1901.	\$500
Chapter 509. Acts of 1902.	30,000
Chapter 443. Acts of 1905.	10,000
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Total.	\$40,500

The amount expended during the year is \$9,256.26.

The total amount expended on this project to Dec. 1, 1906, is \$39,555.05.

PASKAMANSETT RIVER.

The improvement of this river in the town of Dartmouth was authorized by chapter 449 of the Acts of 1905.

On Aug. 2, 1905, a contract was entered into with the Bay State Dredging Company, the lowest bidder, for dredging a channel 400 feet long, 150 feet wide and 5 feet deep at mean low water through the bar at the mouth of the river, the contract price being 48 cents per cubic yard. Owing to the exposed location the work was not completed until May 12, 1906. The total cost of the improvement was \$2,000.

The appropriation relating to this river was as follows:—

Chapter 449, Acts of 1905,	\$2,000
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The amount expended during the year is \$2,000.

The total amount expended for the improvement of this river to Dec. 1, 1906, is \$2,092.15, a portion of which was paid from the appropriation for the survey and improvement of harbors.

CAPE COD CANAL.

In April, 1906, counsel for the Boston, Cape Cod and New York Canal Company filed with the Board tentative plans of the canal authorized to be built under chapter 448 of the Acts of 1899, embodying the previous requirements of the Board, and with other changes and modifications. These plans were examined, and conferences were held with counsel and engineers representing the company, in relation thereto.

On May 14, 1906, a hearing was given, at which repre-

sentatives of the canal company and the New York, New Haven & Hartford Railroad Company, and counsel for owners of property near the proposed location of the canal and on the shores of the upper portion of Buzzard's Bay, appeared and were fully heard, counsel for property owners claiming that the Board is now without power to approve the plans submitted, inasmuch as more than five years has elapsed since the charter was granted.

On May 25, 1906, the Board informed counsel that it would assume jurisdiction to pass on the plans for construction work in tide water. Plans for this canal have not been finally completed by the canal company, and have not been approved by the Board.

On June 11, 1906, the Board of Railroad Commissioners and this Board, as a Joint Board under the provisions of chapter 448 aforesaid, met and heard statements of counsel for the canal company in reference to the proposed filing of certain petitions.

TAUNTON RIVER AND BOSTON HARBOR CANAL.

On Oct. 3, 1906, there was filed with the Board a roll of plans containing 23 sheets, entitled "Plans showing proposed location of ship canal of the New York, Brockton and Boston Canal and Transportation Company, October, 1906." The act incorporating said company is chapter 532 of the Acts of 1906.

FALL RIVER—SOMERSET BRIDGE.

The Railroad Commissioners, the Harbor and Land Commissioners and the County Commissioners of the county of Bristol were constituted a Joint Board by chapter 462 of the Acts of 1903, and directed to locate and construct a new drawbridge over Taunton Great River, between the city of Fall River and the town of Somerset, with the necessary approaches and ways thereto, at a cost not to exceed \$1,000,000.

Plans for this highway bridge, located about 1,200 feet north of the existing Slades Ferry bridge, with the easterly terminus at Brightman Street in Fall River, having been modified by the Joint Board and subsequently approved by this Board, showing a draw with one clear opening 100 feet

wide, instead of 70 feet, for the passage of vessels, were submitted to the Secretary of War, and after reconsideration of the subject and further hearing were approved June 2, 1906.

Detail plans, specifications and form of contract for this work have been prepared by the Joint Board, and proposals for the construction of this bridge invited, to be received up to Dec. 17, 1906, at 12 o'clock noon.

CUTTYHUNK HARBOR.

A survey, estimates of cost and plan for improving the entrance to Cuttyhunk harbor in the town of Gosnold were made by the Board in 1900, under authority of chapter 33 of the Resolves of that year, and a report thereon submitted to the Legislature.

Three projects were suggested, one of which provided for dredging the existing entrance to the depth of 10 feet at mean low water and protecting the entrance with stone riprap, at an estimated cost of \$116,500.

By chapter 450 of the Acts of 1905, the Board was instructed to dredge and otherwise improve this harbor. Inasmuch as the appropriation (\$5,000) was insufficient to fully carry out the project, a modified plan of improvement was adopted, comprising the construction of two stone jetties, one on either side of the existing entrance, to confine the channel and direct it in such a manner as to force it to scour a deeper channel across the bar.

The jetty on the northerly side of the entrance is to be about 1,100 feet long, and the other, on the southerly side of the entrance, about 300 feet long. The top of the main portion of each jetty is to be at the level of mean high tide; at the inner ends the top will slope up to the crest of the beach, and at the outer ends are to be mounds of stone with their tops 4 feet above the general level.

The work was advertised and only one proposal, that of Joseph J. Callahan of Atlantic, Mass., for \$1.08 per ton, was received. On Sept. 28, 1905, a contract was entered into with Mr. Callahan, but work was not commenced until June, 1906. Stone for this work is abundant on the island of Cuttyhunk, and the owner of most of it assented to its

removal and use in the jetties; but, owing to the contractor's inability to handle the stone at a price commensurate with the amount per ton to be paid by the Commonwealth under the contract, and to other unforeseen conditions, he was obliged to discontinue work and abandon the contract in August, 1906. At that time the north jetty had been built nearly its full section for a length of about 1,000 feet, and the south jetty built nearly its full length, but no portion of it was completed. In all, 2,381.8 tons of stone had been deposited, the value of which at the contract price was \$2,572.34.

In October, 1906, arrangement was made with Alpheus P. Tilton of Chilmark, Mass., to complete the work, so far as the amount of money available would permit, the price to be paid being \$2 per ton for stone placed in the jetties.

Mr. Tilton, up to Dec. 1, 1906, has deposited 382½ tons of stone in the jetties, has extended the northerly jetty about 30 feet, has built up the southerly jetty to its full section for about 100 feet, and extended it about 20 feet. About 50 feet of the northerly jetty which had settled have been built up to the required grade.

It is too early as yet to determine to what extent the construction of these jetties will cause the current to deepen the channel across the bar. It is anticipated that Mr. Tilton will complete his work, so far as the appropriation will allow, before next spring.

A map of this harbor was printed with the report of the Board for the year 1900.

Appropriations for this harbor have been made as follows:—

Chapter 33, Resolves of 1900,	\$1,000
Chapter 450, Acts of 1905,	5,000
	<hr/>
Total,	\$6,000

The amount expended during the year is \$3,538.07.

The total amount expended in connection with this harbor to Dec. 1, 1906, is \$3,996.95.

MENAMSHA INLET.

Menamsha Inlet is on the island of Martha's Vineyard in the towns of Gay Head and Chilmark, and is a harbor of refuge for fishermen and for light draft craft generally. The improvement of this harbor was commenced under authority of chapter 323 of the Acts of 1897, which authorized the Board to close the existing outlet of Menamsha Pond, to excavate a new outlet on the boundary line between the above-named towns, and to build protective works on the banks of the new outlet and extending into Vineyard Sound, for the purpose of fixing the location of the new outlet, and thus marking the boundary line.

In 1898-99 and 1903 additional appropriations were made, under which timber and stone jetties were built at the entrance, and a channel 75 feet wide and 5 feet deep at mean low water dredged straight through the flats to the existing channel opposite the road to Vineyard Haven, in place of the old channel, which was very crooked and shallow. The banks of the new channel were partially protected by stone riprap.

By chapter 90 of the Resolves of 1906, the Board was directed to further improve this harbor by enlarging and strengthening the jetties at its entrance and by dredging and enlarging the channel and anchorage basin, the appropriation therefor being \$25,000, of which not more than \$15,000 was to be expended during the year 1906.

A survey was made in June, 1906, and it was found that the banks of the channel had washed down and the navigable depth reduced to less than 3 feet at mean low water.

On Aug. 8, 1906, a contract was entered into with George H. Cavanagh of Boston, Mass., the lowest bidder, to strengthen the present jetties with stone, to excavate the channel and an anchorage basin, and to protect the banks of the channel and anchorage basin with stone riprap. The length of the channel to be dredged is about 1,850 feet, 5 feet deep at mean low water, and for a distance of about 1,500 feet is to be 75 feet wide on the bottom; in the next 200 feet it is to widen gradually to 150 feet, and then to continue that width 150 feet further. The anchorage basin, about 400 feet long and 250

feet wide is to be 5 feet deep at mean low water, and is to be on the easterly side of the channel and just inside the jetties.

The contract prices are as follows: for large stone placed in the jetties, \$2 per ton; for small stone placed in the jetties or as riprap on the banks of the channel and anchorage basin, \$1.75 per ton; for dredging and depositing the material at sea, 38 cents per cubic yard, measured in scows.

The work of excavating the channel was commenced Nov. 7, 1906. Up to Dec. 1, 1906, about 1,300 cubic yards of material had been excavated from the channel, and 40 tons of stone placed as riprap on its banks. It is not anticipated that very much progress will be made on the work before next spring. The contract provides that all work shall be completed on or before June 30, 1907.

Appropriations for this harbor have been made as follows:—

Chapter 323, Acts of 1897,	\$2,000
Chapter 357, Acts of 1898,	2,000
Chapter 133, Acts of 1899,	5,000
Chapter 394, Acts of 1903,	10,000
Chapter 90, Resolves of 1906,	25,000
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Total,	\$44,000

The amount expended during the year is \$759.27.

The total amount expended for the improvement of this harbor to Dec. 1, 1906, is \$21,258.

VINEYARD HAVEN HARBOR.

On Sept. 8, 1905, the Board, acting under authority of chapter 442 of the Acts of 1905, entered into a contract with E. S. Belden & Sons of Hartford, Conn., the lowest bidder, for the construction of a stone breakwater on the shoal ground on the westerly side of this harbor northerly of the steamboat wharf. This breakwater, about 700 feet in length, was completed Aug. 13, 1906, and forms a safe and convenient anchorage for the small fishing boats and yachts in the harbor. The original plans for this improvement, prepared

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under authority of chapter 95 of the Resolves of 1904, provided that a breakwater 1,200 feet long be built; thus an additional 500 feet is necessary to complete the original project.

Appropriations for this harbor have been made as follows:—

Chapter 95, Resolves of 1904,	\$500
Chapter 442, Acts of 1905,	10,000
	<hr/>
Total,	\$10,500

The amount expended for this improvement during the year is \$9,965.31.

The total amount expended in connection with this harbor to Dec. 1, 1906, is \$10,219.11.

NANTUCKET HARBOR.

Under authority of chapter 451 of the Acts of 1905, an area on the northwesterly end of Hussey shoal, about 400 feet long and 300 feet wide, was dredged in 1905 to a depth of 12 feet at mean low water, at a cost of \$4,848.85.

Under chapter 453 of the Acts of 1906, the Board was directed to expend in its discretion not exceeding \$5,000 for further improving the harbor by dredging the shoals lying between Brant Point and the wharves.

An examination of the locality was made in August, 1906, and the Board was informed by boatmen where the shoals were located. A survey was made in October; but, as the appropriation was so small, it was decided to delay beginning work until there was other dredging to be done in the vicinity which would warrant the bringing of a dredge to this locality.

Appropriations for the improvement of this harbor have been made as follows:—

Chapter 451, Acts of 1905,	\$5,000
Chapter 453, Acts of 1906,	5,000
	<hr/>
Total,	\$10,000

The amount expended during the year is \$713.45.

The total amount expended for the improvement of this harbor to Dec. 1, 1906, is \$5,939.56.

WRECKS AND OBSTRUCTIONS.

On Nov. 20, 1906, the Board was notified by the harbor master of Boston that the schooner "Mary Lee Newton" was ashore on the spit near Boston light, in Boston harbor, and that she was liable to float and become a menace to navigation. Maj. Edward Burr, Corps of Engineers, U. S. A., in charge of rivers and harbors in this district, was informed of this wreck. It appeared to be a case for action by the Federal government rather than by the State.

No expenditures have been made during the year, from the appropriation of \$916.66 under chapter 14 of the Acts of 1906, for the removal of wrecks and other obstructions from tide water.

WORK OF THE UNITED STATES IN RIVERS AND HARBORS OF THE COMMONWEALTH.

The Board is indebted to Maj. Edward Burr, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and Lieut.-Col. J. H. Willard, Corps of Engineers, U. S. A., who is in charge of similar work in southern Massachusetts, for the following statements, which show the work accomplished in the rivers and harbors of the Commonwealth during the fiscal year ending June 30, 1906:—

STATEMENT OF MAJ. EDWARD BURR, CORPS OF ENGINEERS,
U. S. A.

BOSTON, MASS., Nov. 27, 1906.

Board of Harbor and Land Commissioners, Commonwealth of Massachusetts, State House, Boston, Mass.

SIRS:— In accordance with your request of Nov. 1, 1906, I have the honor to furnish the following summary of work accomplished by the United States during the fiscal year ending June 30, 1906, upon the improvement of rivers and harbors in Massachusetts under the charge of this office.

Newburyport Harbor.

There were 2,500 tons of stone deposited in the north jetty in retopping about 550 linear feet of that jetty previously completed; the south jetty was extended 94 linear feet by the deposit of 8,672 tons of stone.

Merrimac River.

At the bend in the river about 3,000 feet above Rocks Bridge the channel was widened from 100 to 150 feet and redredged to the depth of 7 feet by dredging 3,537 cubic yards of sand; and in the section of channel at Haverhill 1,017 cubic yards of mud, clay and bowlders were dredged.

Breakwater for Harbor of Refuge, Sandy Bay, Cape Ann.

During the fiscal year no stone was deposited in the breakwater, the contractors having been engaged in assembling plant and opening a quarry.

Gloucester Harbor.

In the breakwater at the entrance to this harbor 12,117 tons of stone were deposited, completing the entire breakwater, 2,065 feet in length, including a rubble mound at its end for a light-house site.

Salem Harbor.

There were 37,823 cubic yards of mud, sand, clay, gravel and small bowlders dredged in completing the authorized channel 10 feet deep at mean low water, extending from that depth in the harbor to the outer end of the wharves, 300 feet wide at the entrance and gradually narrowing to 200 feet at Derby Wharf Light.

Lynn Harbor.

Under the continuing contract of June 19, 1905, the Bay State Dredging Company dredged during the fiscal year 240,668 cubic yards, obtaining a channel 15 feet deep at mean low water, extending with a width of 100 feet from the deep basin opposite Little Nahant 5,500 feet toward the anchorage basin at the city wharves.

Mystic River.

There were 9,672 cubic yards dredged, extending the improved channel with a depth of 4 feet for a further distance of 1,900 feet to a point 1.2 miles toward Medford from the first turn above Dennings wharf.

Mystic River below the Mouth of Island End River.

There were 88,641 cubic yards of mud, sand, etc., dredged, by which the channel 25 feet deep at mean low water was increased in width to 150 feet off the East Boston wharves, to 200 feet thence to the Chelsea bridge, and to 300 feet above that bridge to the mouth of Island End River.

Malden River.

There were 17,807 cubic yards of sand and mud dredged from the improved channel, restoring the depth of 12 feet at mean high water with a width of 75 feet, increasing to 100 feet at the bends.

Boston Harbor.

Twenty-seven-foot Channel. — During the fiscal year the removal was completed of 24 ledges, containing 19,231 cubic yards, from the lower main ship channel; and of 11 ledges, containing 2,066 cubic yards, from the upper main ship channel.

Thirty-foot Channel. — There were 36,859 cubic yards of sand, clay and mud, and 141½ cubic yards of bowlders, dredged from this channel, completing, on Oct. 17, 1905, the entire projected channel 30 feet deep at mean low water and 1,200 feet wide from President Roads through Broad Sound to the sea.

Thirty-five-foot Channel. — Under this project during the year there were dredged 2,513,125 cubic yards of material from the channel between President Roads and the Navy Yard, Chelsea and Charles River bridges, and 526,638 cubic yards of material from the channel extending in Broad Sound from President Roads to the sea. Drilling and blasting of rock in the channel west of President Roads was also in progress.

Sea Walls. — On Deer, Gallops and Lovells islands minor repairs were made to the sea walls, and their foundations were protected with riprap.

Chelsea Creek.

There were 125,261 cubic yards of mud, sand and clay dredged, obtaining a channel 18 feet deep at mean high water, 75 to 150 feet wide, and extending 2,800 feet from the head of the natural 18-foot channel to Proctor's wharf.

Town River.

By dredging 50,984 cubic yards of mud, etc., the improved channel was restored to its full projected width and depth.

Weymouth Fore River.

There were 148,995 cubic yards of gravel, etc., dredged from the portion of the river below Weymouth Fore River bridge, under the project to obtain a channel 18 feet deep at mean low water and 300 feet wide.

Weymouth River.

In the section of this river above Weymouth Fore River bridge 11,245 cubic yards of mud, etc., were dredged; and the improved channel was completed and restored to its full projected width and depth, except over four small ledges uncovered by dredging.

Plymouth Harbor.

Minor repairs were made to the riprap dike in Long beach.

Provincetown Harbor.

The works of protection on the beaches have been extended and repaired during the fiscal year as follows: at Long Point 405 tons of rubble stone were deposited in the breakwater; in the vicinity of Abel Hill dike 4,658 feet of sand-catches, 460 feet of single bulkhead and 794 feet of double bulkhead were built, 7,000 square feet of beach crest were planted to beach grass, and minor repairs were made to the works of protection there and at Wood End.

Removing Sunken Vessels or Craft obstructing or endangering Navigation.

In July, 1905, there was removed the wreck of the small schooner "Chromo," sunk by collision with the steamer "Calvin Austin" on July 3, 1905, in the entrance to Boston harbor, about midway between Point Allerton and Shag Rocks.

Very respectfully,

EDW. BURR,
Major, Corps of Engineers.

Statement of Lieut.-Col. J. H. Willard, Corps of Engineers, U. S. A., showing the work done by the United States on the rivers and harbors of Massachusetts under the Newport, R. I., engineer office, during the fiscal year ending June 30, 1906:—

Hyannis Harbor.

The work of dredging the anchorage area protected by the breakwater under contract with the Morris & Cumings Dredging Company was commenced Nov. 16, 1905, and completed Jan. 13,

1906. During this period 28,874 cubic yards of mud and sand were removed, completing all projected work for this harbor. The total expenditure by the United States for the improvement of this harbor since 1827 has been \$198,413.50, of which \$123,431.82 were for construction of the breakwater and \$74,882.68 for dredging.

Nantucket Harbor.

The work under the contract with E. S. Belden & Sons of Hartford, Conn., for the extension of the east jetty, in progress at the close of the fiscal year, was continued until Sept. 1, 1905, when the contract was completed. The total amount of stone placed in the jetty under this contract was 10,603½ tons, extending the jetty 1,379 feet, raised to the half-tide level, with mounds every 200 feet extending above high water, and a mound for the support of a lantern staff at the outer end.

The work of dredging under the contract with Morris & Cummings Dredging Company of New York, which was in progress at the close of the last fiscal year, was continued until Dec. 20, 1905, when the contract was completed. The total amount dredged under the contract was 194,063 cubic yards of sand, which gave a channel through the bar 200 feet wide and 12 feet deep at mean low water.

The breachway in the narrow beach known as the "Haul-over," separating the head of the harbor from the ocean on the eastern side of the island, still keeps open.

Vineyard Haven.

No works of improvement were in progress during the past fiscal year.

Little Harbor, Woods Hole.

The work under the contract with Charles M. Cole of Fall River, Mass., for dredging a channel 150 feet wide and a turning basin opposite the lighthouse wharf at least 300 feet wide and 12 feet deep at mean low tide, which was in progress at the close of the last fiscal year, was completed Aug. 17, 1905. The total amount dredged under the contract was 76,000 cubic yards.

Woods Hole Channel.

A contract was awarded to R. G. Packard Company of New York for the removal of bowlders and shoal spots in the channels leading from Great Harbor to Buzzards Bay, to a depth of 13 feet at mean low water, at the rate of \$1.74 per cubic yard. Work under this contract was commenced Dec. 23, 1905, and continued until March 8, 1906, when the dredge was removed temporarily for other work in this engineer district.

Up to the temporary suspension of the work 10,928 cubic yards of material had been removed, clearing the "Broadway" channel of all shoals, and removing part of the shoal at the junction of the two channels.

Weepecket Rock. Buzzards Bay.

The removal of this rock by drilling and blasting, which had just been commenced at the beginning of the fiscal year, was completed July 3, 1905; about 40 tons of rock were removed.

New Bedford Harbor.

A small area of rock just north of Fish Island, the top of which was slightly above the grade of the bottom of the channel, was blasted, and the required depth of 18 feet at mean low tide was secured over it.

A careful survey of the harbor from Clark Point to Belleville was made, in compliance with the provisions of the river and harbor act of March 3, 1905, and a new project submitted for a channel of 25 feet depth from Butler's Flats to a short distance above the new bridge, and from there to Belleville with a depth of 18 feet at mean low water; also for enlarged anchorage grounds in front of the city, with depths of 25 and 18 feet at mean low tide.

Taunton River.

No works of improvement were in progress during the last fiscal year.

Fall River Harbor.

No works of improvement were in progress during the last fiscal year.

Removal of Wrecks.

The following wrecks were removed, so as no longer to form obstructions to navigation: schooner "Nimrod," sunk on Stone Horse Shoal, eastern entrance to Nantucket Sound; schooner "M. C. Haskell," sunk on northeast part of Handkerchief Shoal; schooners "Viola" and "Mail," sunk near head of Vineyard Haven; schooner "Charles E. Sears," sunk in Chatham Bay; and schooner "Joseph Hay," sunk about 1 mile south of Cuttyhunk Island.

STATE BOUNDARIES.

In the examination of the monuments marking the boundary lines of the State, made last year under the provisions of section 4, chapter 1 of the Revised Laws, several were found to be in imperfect condition.

In co-operation with the State Engineer of New Hampshire, the two imperfect bounds on the Massachusetts-New Hampshire line were reset, but work on the other monuments was delayed until 1906.

On May 10, 1906, notice was received from the Governor of Rhode Island that Mr. George A. Carpenter of Pawtucket had been appointed to co-operate with the Board in resetting the monuments on the Rhode Island line. The 6 monuments on the easterly boundary of Rhode Island, which were reported as imperfect in 1905, as well as the monument on the westerly shore of Mount Hope Bay which was disturbed by ice in the winter of 1905, have been reset in a substantial and permanent manner.

On the northerly line, 12 new bounds, 9 feet long and 12 inches square, have been set alongside the 12 small bounds which latter had been set with their tops substantially flush with the surface of the ground, so that they were difficult to find. The new bounds project 4 feet above the surface, and serve as markers for the original bounds.

In addition, 3 other new bounds were set, as follows: One on the westerly side of Social Street, between Blackstone and Woonsocket, 28.9 feet west of the old bound, which stood close to the travelled way and was found to have been broken off. The lower end of the old monument was left in place.

The second bound, on the easterly side of the Slatersville road, about 2 feet east of the center of the lower portion of the old stone, which was left in place.

The third bound, in the intersection of the State line with the line between the towns of Blackstone and Uxbridge. An old bound, supposed to mark this town corner, was found nearly 40 feet south of the State line.

On the Vermont line, 2 monuments were reported as being insecurely set. In response to inquiries, Mr. R. J. Sanford, who had represented Vermont in the examination of 1905, stated that he had not been authorized to co-operate in resetting the bounds, and no action has been taken by that State. The season was well advanced, and the two monuments were reset in a substantial manner, under the direction of this Board.

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The 3 stone monuments reported as insecurely set on the New York line were reset in a substantial manner, in co-operation with the State Engineer of New York.

The appropriation for this work was as follows:—

Chapter 43, Acts of 1905. \$1,500

The amount expended during the year is \$579.93.

The total amount expended to Dec. 1, 1906, is \$1,367.66.

CONNECTICUT BOUNDARY LINE.

By chapter 46 of the Resolves of 1905, the Board, acting with agents of the State of Connecticut, was authorized to locate and define by proper monuments the boundary line between Massachusetts and Connecticut. The State of Connecticut appointed a commission, consisting of the Governor, the Attorney-General and Hon. Frank C. Sumner, and each State appropriated \$7,000 to carry out the purposes of the resolve.

During the year a survey has been made of the entire line, and the location of all the existing monuments was determined. From results so obtained, and the records, the two Boards have been able to determine the location of the line as established in 1803 for the section west of the Connecticut River and in 1826 for the section east of that river.

This work was completed so late in the season that it was deemed advisable to defer setting the monuments until the spring of 1907. The larger part of the granite monuments have been cut and a few distributed along the line, and it is proposed to prosecute the work of setting them as soon as the weather is suitable in the spring. In order to complete the work, an additional appropriation of \$1,000 will be required.

An examination of a portion of the line west of the Connecticut River was made by both Boards on Sept. 25, 1906, when the surveys were nearly completed, at which time all questions as to the exact location of the different portions of the line were discussed and agreed upon.

Upon the completion of the work, plans showing the location of the line and the various monuments marking it will be prepared and filed with the Secretary of State.

The appropriation for re-marking this boundary line was as follows:—

Chapter 46, Resolves of 1905, \$7,000

The amount expended during the year is \$4,322.36.

The total amount expended to Dec. 1, 1906, is \$4,558.58.

TOWN BOUNDARY SURVEY.

The work of determining the location of town boundaries has been continued with the same organization as for the past few years, except that the head of one field party was detailed for six months on the work of re-locating and re-marking the boundary line between Massachusetts and Connecticut. The other party was enlarged, so that substantially the same amount of field work has been done this year as in past years.

The work during the year has been, and from this time on will be, somewhat different from what has been done in the past few years. Previous to 1900, the general triangulation work had been extended over a very large area in advance of the detailed work of determining the individual bounds and the survey of roads and streams forming portions of the boundaries. From 1900 to the beginning of 1906, a large part of the work was the filling in of this detailed work. This was substantially completed in 1905, and during the past year the general triangulation work has been extended and the detailed work carried along together, this being deemed more economical.

Field work was commenced on May 2, 1906, and terminated Nov. 21, 1906.

The three permanent members of the field force were engaged during the winter in plotting and preparing the results of the season's work, and securing the data necessary for use in the field work of the coming year.

The field work during the year was in a group of towns along the northerly portion of the State, from Ashburnham to the Connecticut River. In all, the locations of 125 bounds marking angles in town lines, and 185 survey points on summits of hills, were determined by triangulation; and the positions of 27 triangulation points determined in the survey

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of the Connecticut boundary line, which will be used later in determining the location of town corners near that boundary line.

In addition, topographical surveys have been made of about 2 miles of road and 30 miles of streams, that formed parts of town boundaries.

The positions of 14 new town corners, established by the Legislature on the recommendation of the Board, have been located and marked on the ground; and in most of these cases the necessary stone monuments have already been set by the town officers.

As in previous years, it was found during the prosecution of the work that a number of the boundary lines were very crooked, and in some cases indefinite. Town officers frequently expressed their desire to have the lines straightened; consequently, after consultation with them, the Board submitted to the towns, for their concurrence, plans for changing and straightening portions of 10 boundary lines. In the case of 8 of them, the towns of Charlton, Douglas, Dudley, Grafton, Millbury, Oxford, Shrewsbury, Southbridge, Westborough and the city of Worcester, voted to concur, while the town of Sutton referred the question of the approval of the other 2 to the selectmen for a report.

The office force has been employed in computing the positions of town corners and triangulation stations whose positions were determined by the field work the previous season; in making abstracts from the statutes relating to the establishment of town boundaries; preparing the results of the work for permanent record; and assisting in the preparation of information for future field work. The indexing of field notes has been nearly brought up to date.

Photographs and negatives showing the monuments marking the boundary lines and of the triangulation stations have been compactly filed and indexed during the year.

Two new atlases, describing the boundary lines of 4 cities and 24 towns, viz., Gloucester, Newburyport, Amesbury, Essex, Georgetown, Groveland, Hamilton, Ipswich, Manchester, Merrimac, Newbury, Rockport, Rowley, Salisbury,

Topsfield, Wenham and West Newbury; and Andover, Boxford, Haverhill, Lawrence, Lynnfield, Methuen, Middleton, North Andover, North Reading, Reading and Wilmington, have been distributed during the year.

Two other atlases, describing the boundaries of 35 cities and towns, grouped as follows, viz., Barnstable, Brewster, Chatham, Chilmark, Cottage City, Dennis, Eastham, Edgartown, Falmouth, Gay Head, Gosnold, Harwich, Mashpee, Nantucket, Orleans, Provincetown, Tisbury, Truro, Wellfleet, West Tisbury, Yarmouth; and Ayer, Billerica, Carlisle, Chelmsford, Dracut, Dunstable, Groton, Littleton, Lowell, Pepperell, Shirley, Tewksbury, Tyngsborough, Westford, — have been prepared for the printer, with the exception of two short lines, one in each atlas, which were changed by the Legislature in 1905 and 1906, and as yet not fully marked by the town authorities. Work is in progress on each of them at the present time, and the atlases will be completed at an early date.

Another atlas is in preparation, describing the boundaries of 20 cities and towns, viz., Berlin, Bolton, Boxborough, Boylston, Clinton, Harvard, Holden, Hubbardston, Hudson, Lancaster, Marlborough, Northborough, Oakham, Paxton, Princeton, Rutland, Southborough, Sterling, Stow, West Boylston.

On Dec. 1, 1906, atlases describing the boundaries of 150 cities and towns, out of a total of 354 in the Commonwealth, had been completed and distributed as provided by statute; and 2 additional atlases, containing the descriptions of 35 additional cities and towns, were substantially ready for publication.

SALE AND DISPOSITION OF MASSACHUSETTS ATLAS SHEETS AND TOWN BOUNDARY ATLASES.

There has been paid into the treasury of the Commonwealth during the year, under authority of chapter 57 of the Resolves of 1890 and chapter 360 of the Acts of 1900, the sum of \$204.10, received from the sale of Massachusetts atlas sheets and town boundary atlases. Under chapter 360

of the Acts of 1900, 161 town boundary atlases have been distributed among the officers of the various cities and towns and others.

CONNECTICUT RIVER.

By chapter 344 of the Acts of 1885, this Board was given the general care and supervision of the Connecticut River and its banks and of all structures therein, to prevent and remove unauthorized encroachments and causes of every kind which may in any way injure the river, and to protect and develop the rights and property of the public therein.

A survey of that portion of the river in front of the mills in Holyoke was made in June, 1906, in order to determine the location of a line to which parties desiring to encroach upon the river might, under license from the Board, fill or build structures. The exact location of this river line has not yet been fixed.

Numerous complaints having been made in relation to the unnecessary obstruction of navigation in portions of this river, caused by booms placed across the river for holding and sorting logs, and the parties owning or controlling these booms having failed to use them in carrying on this industry so as not to unreasonably obstruct the passage of boats in the river, the matter was referred to the district attorney for the northwestern district, who brought this subject to the attention of the grand jury, who found an indictment against the company complained of.

It is hoped that a satisfactory adjustment of this matter will be effected at an early date.

In September, 1906, an examination was made of the riprap along the river bank in Hadley, and, in the sections where it was reported last year that cavings had occurred, it was found that the riprap below the summer water level had been insufficient to fully protect the bank, and that the current had cut in behind it and was undermining the bank so that the upper portions were caving in. The location where this has occurred was riprapped in 1888 and 1889, and the bank under water has now become so steep that the only effective method of protecting it is to cover it with a coating of stone riprap.

It seemed to be imperative that the work should be done, so far as possible, at once, with the balance available from the appropriation for the survey and improvement of harbors; and in October, 1906, Mr. E. E. Davis of Northampton was employed to supervise the work, purchase the stone and employ the necessary labor to deposit it in place. The stone was purchased at a cost of \$1.42½ per ton of 2,000 pounds, delivered on the river bank, and local labor was employed to deposit the stone in place on the river bank. In all, 678½ tons have been deposited, at a total cost, including labor and incidental expenses, of \$1,437.01. With this stone, 364 feet of the river bank has been covered.

The upper portion of the bank, above the ordinary summer level of the river, appears to be in a very good state of repair, and requires no repairs except a few feet above the water level, where it has caved down by the undermining of the bank below the water. If no further work is done, the whole bank will undoubtedly be undermined in a few years. To effectually protect the sections done in 1888 and 1889, which are most exposed to the current of the river, will probably require an appropriation of \$10,000.

By chapter 491 of the Acts of 1906, an appropriation of \$3,500 was made for extending the riprap on the westerly bank of the Connecticut River in the town of Agawam, south-erly from the riprap done in 1894, 1895 and 1896.

An examination of the locality was made, and it was found that the principal wear was opposite a grove known as Calla Shasta, a short distance below the work done in 1896. The bank between the grove and the old work showed but slight evidence of erosion.

Mr. E. E. Davis of Northampton was employed to super-intend the work, and he was instructed to grade and cover the bank from low-water mark to above high-water mark, where the erosion was greatest, in front of the Calla Shasta grove, and to protect the bank between that point and the old work wherever any signs of erosion existed, but not to disturb the portion of the bank which is now covered with trees and bushes. The method of doing the work is substantially the same as in previous years.

The stone was purchased and delivered on the river bank at a cost of \$2.30 per yard of 4,000 pounds, equivalent to \$1.15 per ton of 2,000 pounds, the grading of the bank, the cutting and laying of the brush and covering it with the stone being done by local day labor. About 200 feet of the bank was graded and covered with brush and stone, and the work is still in progress. It is not expected that it will be wholly completed this fall, but it will take but a short time to complete it in the spring. The stone will be delivered during the winter, and the grading and placing done as soon as the river is down. The 1,000 feet lying between this and the work done in 1896 will be protected wherever necessary.

A small portion of the appropriation will be used next spring in planting willows between the stones of the riprap.

The cost of the work to Dec. 1, 1906, is \$639.06.

Appropriations relating to this river have been made as follows:—

Chapter 95, Resolves of 1888, Hadley, . . .	\$15,000
Chapter 17, Resolves of 1889, Hadley, . . .	15,000
Chapter 90, Resolves of 1891, West Springfield, . .	5,000
Chapter 101, Resolves of 1894, Agawam, . . .	2,000
Chapter 67, Resolves of 1895, Agawam, . . .	3,000
Chapter 77, Resolves of 1896, surveys, . . .	1,000
Chapter 95, Resolves of 1896, Agawam, . . .	1,500
Chapter 58, Resolves of 1897, Agawam, . . .	1,500
Chapter 82, Resolves of 1897, inquiry as to navigation, . . .	2,500
Chapter 104, Resolves of 1898, reopening river to navigation, . . .	2,000
Chapter 100, Resolves of 1900, Hadley, . . .	15,000
Chapter 94, Resolves of 1901, Hadley, . . .	15,000
Chapter 82, Resolves of 1903, Hatfield, . . .	7,500
Chapter 491, Acts of 1906, Agawam, . . .	3,500
Total,	<u>\$89,500</u>

The amount expended in connection with this river during the year is \$2,076.07.

The total amount expended to Dec. 1, 1906, is \$84,532.43, which has been paid for protective works, surveys, etc., as follows:—

Agawam,	\$8,644 82
Hadley,	62,301 42
Hatfield,	6,700 75
West Springfield,	5,051 49
Surveys, etc.,	1,833 95

A portion of the amount expended has been paid from the appropriation for repairing damages along the river banks of the Commonwealth.

GREAT PONDS.

By chapter 379 of the Acts of 1904, this Board is authorized, subject to the approval of the Governor and Council, to sell or lease any of the islands owned by the Commonwealth in the great ponds. During the year an application was received for the purchase or lease of Loon Island in Chebacco Lake, Hamilton. This matter is still pending.

On Sept. 17, 1906, a petition was received from the Burgess Cranberry Company for license to build dikes and flumes and draw water from Gibbs Pond, containing about 30 acres, in Nantucket, for the purpose of flowing its cranberry bogs. At the hearing on this petition the proprietors of the common and undivided lands of Nantucket, through their counsel, appeared and objected to the Board taking any action in this matter, claiming that this pond and all other great ponds in Nantucket, under ancient ordinance or patent, etc., belong to said proprietors, that Gibbs Pond is not a great pond belonging to the Commonwealth, and therefore this Board has no jurisdiction over the same.

One of the proprietors assured the company in the presence of the Board that they would grant permission to take water from this pond, if applied for. While the Board disclaimed any authority or attempt to determine the title to this pond, it concluded it would be better to issue the license, which contains the following usual clause in all licenses: "Nothing in this license shall be so construed as to impair the legal rights of any person." The proprietors thus will have the right to appeal to the courts on the question of title, if they should conclude to do so, and the granting of this license will not affect the question.

PROVINCE LANDS.

The reclamation of the territory belonging to the Commonwealth known as the Province Lands, located in Provincetown and containing about 3,290 acres, has been in progress under the direction of the Board since 1893. The method adopted for this work is the planting of beach grass, shrubs and trees to cover and hold the blowing sands, and has been fully described in previous reports.

Work of the above character done since the commencement of operations in the spring of 1895 covers a total area of about 300 acres, about 30 acres having been treated during the year.

The road, 10,200 feet long, built across this property to the Race Point life-saving station under previous appropriations, at a cost of \$3,450, has been repaired during the year at a cost of \$207.30, and is now in good condition for travel.

An inspection of these lands was made in November, 1906, and it appeared that the beach grass, bayberry and other covering of the several ranges of sand dunes were in good condition.

In March, 1906, a permit was granted to the Department of Commerce and Labor at Washington to erect three permanent structures on these lands, to be used as naval speed trial beacons. This work is now in progress.

The sum of \$151.91 has been received during the year from licenses which have been issued to various parties to cultivate and pick cranberries in the bogs on these lands, and to mow meadow lands.

The vacancy caused by the death in April last of James A. Small, superintendent, who had been connected with the project for the reclamation of these lands since its inception, was filled in May, 1906, by the appointment of George W. Tuttle as superintendent.

Appropriations relating to these lands have been made as follows:—

Chapter 480, Acts of 1893,	. . . . .	\$2,000
Chapter 287, Acts of 1894,	. . . . .	3,000
Chapter 44, Acts of 1895,	. . . . .	3,500
Chapter 49, Acts of 1896,	. . . . .	3,500
Chapter 216, Acts of 1897,	. . . . .	3,500
Chapter 107, Acts of 1898,	. . . . .	2,500
Chapter 145, Acts of 1899,	. . . . .	10,000
Chapter 511, Acts of 1902,	. . . . .	10,000
Chapter 396, Acts of 1905,	. . . . .	10,000
Total,	. . . . .	<hr/>\$48,000

The amount expended during the year is \$3,361.75.

The total expenditure on these lands to Dec. 1, 1906, is \$42,009.59.

LICENSES GRANTED DURING THE YEAR.

- Nos.**
3013. Petition of Outram Bangs and Richard P. G. Hogner for license to build a flume and draw water from Little Long Pond, in the towns of Plymouth and Wareham. Granted Dec. 5, 1905.
 3014. Petition of the New England Dredging Company for license to build bulkheads and pile structures, fill solid and to dredge in Dorchester Bay, in Boston. Granted Dec. 21, 1905.
 3015. Petition of the city of Boston for license to build new bulkheads and repair its wharf at Rainsford Island, in Boston harbor. Granted Dec. 21, 1905.
 3016. Petition of Wesley A. Gove for license to maintain a pile wharf, as now built, on Belle Isle Inlet, in Boston. Granted Dec. 29, 1905.
 3017. Petition of Freeman B. Shedd for license to maintain a wharf, partly solid and partly on piles, and to widen a portion of the same on piles in Cotuit harbor, in Barnstable. Granted Jan. 10, 1906.
 3018. Petition of the Cambridge Gas Light Company for license to build a sea wall and fill solid on Broad Canal, in Cambridge. Granted Jan. 10, 1906.
 3019. Petition of the Boston, Revere Beach & Lynn Railroad Company for license to build an addition to its present terminal, on piles, in Boston harbor, at East Boston. Granted Jan. 10, 1906.
 3020. Petition of the Fall River Electric Light Company for license to widen and extend its wharf on Taunton River, in Fall River. Granted Jan. 10, 1906.

3021. Petition of George I. Sears and Dudley A. Dorr for license to fill solid in Boston harbor near the Reserved Channel at South Boston. Granted Jan. 11, 1906.
3022. Petition of Levi L. E. Taylor and H. L. Taylor for license to fill solid in Merrimack River in Haverhill. Granted Jan. 11, 1906.
3023. Petition of the city of Cambridge for approval of plans for constructing a bridge with a draw therein, across Lechmere Canal in continuation of the lines of Commercial Avenue in Cambridge. Granted Jan. 15, 1906.
3024. Petition of the Boston & Northern Street Railway Company for license to dump snow and ice into the tide waters of Mystic River from Chelsea bridge north, in Boston. Granted Jan. 19, 1906.
3025. Petition of Henry J. Thayer for license to build a flume, lay a pipe and draw water from Hoyt Pond, in Plymouth. Granted Jan. 23, 1906.
3026. Petition of Frederick Passard for license to build and maintain a foot bridge over Fall River at Monument Beach in Boston. Granted Jan. 29, 1906.
3027. Petition of Langdon Hutchinson for license to build and maintain a pile pier in Buzzards Bay at Wings Neck, in Boston. Granted Jan. 29, 1906.
3028. Petition of the city of Boston for approval of plans for building pile structures and laying a water pipe across Fort Point Channel near Congress Street bridge, in Boston. Granted Feb. 2, 1906.
3029. Petition of the Cape Ann Anchor Works for license to build a bulkhead and pile platform, fill solid and to dredge in Annisquam River, in Gloucester. Granted Feb. 6, 1906.
3030. Petition of the trustees of the Trianon Trust for license to build a pile wharf in Hull Bay at Windmill Point, in Hull. Granted Feb. 6, 1906.
3031. Petition of the John Morrison Company for license to build a pile wharf in Boston harbor, at East Boston. Granted Feb. 6, 1906.
3032. Petition of Peter T. Fallon and others for license to build a sea wall and fill solid on Town River, in Quincy. Granted Feb. 8, 1906.
3033. Petition of the Barnstable Pier Association for license to build and maintain a pile pier and float in Barnstable harbor, in Barnstable. Granted Feb. 14, 1906.
3034. Petition of J. C. Terry for license to build a wharf, partly solid and partly on piles, on Taunton River, in Fall River. Granted Feb. 14, 1906.

Nos.

3035. Petition of Francis W. Lawrence and others for license to build a wharf, partly solid and partly on piles, and to dredge on Mystic River, in Boston. Granted March 2, 1906.
3036. Petition of Henry W. Smith and Edwin G. Smith for license to build bulkheads, fill solid and to dredge in Chelsea Creek, in Chelsea. Granted March 6, 1906.
3037. Petition of the New York, New Haven & Hartford Railroad Company for license to reconstruct its bridge and build a temporary bridge, on piles, across Neponset River, in Boston and Quincy. Granted March 8, 1906.
3038. Petition of the Rockport Granite Company of Massachusetts for license to build a stone pier and breakwater in extension of its wharf in Massachusetts Bay near Folly Cove, in Rockport. Granted April 2, 1906.
3039. Petition of Samuel Cabot for license to build a pile wharf and to drive piles on Chelsea Creek, in Chelsea. Granted April 3, 1906.
3040. Petition of the New Bedford Yacht Club for license to build bulkheads, fill solid and to dredge in Apponagansett harbor, in Dartmouth. Granted April 3, 1906.
3041. Petition of the Boston & Northern Street Railway Company for license to build a pile addition to Derby wharf on South River, in Salem. Granted April 3, 1906.
3042. Petition of Herbert O. Phillips for license to build and maintain a pile pier in Vineyard Haven harbor, in Cottage City. Granted April 3, 1906.
3043. Petition of Warren Brothers Company for license to build a bulkhead and fill solid on Broad Canal, in Cambridge. Granted April 5, 1906.
3044. Petition of the estate of Reuben Sherburne for license to build a bulkhead and fill solid on Broad Canal, in Cambridge. Granted April 5, 1906.
3045. Petition of the American Rubber Company for license to build a pile and timber bulkhead and fill solid on Broad Canal, in Cambridge. Granted April 6, 1906.
3046. Petition of John L. Blanchard for license to maintain a boat house on Danvers River, in Beverly. Granted April 9, 1906.
3047. Petition of John H. Ross for license to build and maintain a foot bridge and float in Hingham Bay, in Hingham. Granted April 9, 1906.
3048. Petition of the trustees of the National Dock Trust for license to widen a portion of the north pier, on piles, on property formerly owned by the National Dock and Warehouse Company, in Boston harbor, at East Boston. Granted April 11, 1906.

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Nos.

3049. Petition of the Boston & Albany Railroad, the New York Central & Hudson River Railroad Company, Lessee, for license to build a dolphin and extend the guard pier of its Grand Junction railroad bridge on Charles River, in Boston. Granted April 11, 1906.
3050. Petition of the town of Cottage City for license to build and maintain a pile pier in Vineyard Sound, in Cottage City. Granted April 18, 1906.
3051. Petition of the Eastern Coal Company for license to build a bulkhead and pile wharf and fill solid on Chelsea Creek, in East Boston. Granted April 23, 1906.
3052. Petition of the Gibby Foundry Company for license to build a bulkhead and fill solid on Chelsea Creek, in East Boston. Granted April 23, 1906.
3053. Petition of the Boston and Lockport Block Company for license to build a bulkhead and fill solid on Chelsea Creek, in East Boston. Granted April 23, 1906.
3054. Petition of the Suburban Gas and Electric Company and the Lynn Gas and Electric Company for license to lay and maintain two cables across Saugus River, in Lynn and Revere. Granted May 1, 1906.
3055. Petition of John D. Crosby for license to locate and maintain a float in Marblehead harbor, in Marblehead. Granted May 2, 1906.
3056. Petition of Alfred Sorensen for license to widen his wharf, on piles, on Chelsea Creek, in Chelsea. Granted May 2, 1906.
3057. Petition of the Old Colony Street Railway Company for license to build a sea wall and pile wharf, to fill solid and dredge on Weymouth Fore River at Quincy Point, in Quincy. Granted May 2, 1906.
3058. Petition of the Fall River Electric Light Company for license to extend and enlarge its wharf on Taunton River, in Fall River. Granted May 2, 1906.
3059. Petition of O. Howard Crowell for license to build and maintain a pile wharf and a boat way in Lewis Bay at Hyannis, in Barnstable. Granted May 2, 1906.
3060. Petition of the Cochrane Chemical Company for license to build bulkheads, dikes and pile wharf, to fill solid and dredge on Mystic River, in Everett. Granted May 3, 1906.
3061. Petition of the Tide Water Broken Stone Company for license to build and maintain a pile wharf in Rock Island Cove, in Quincy. Granted May 8, 1906.

Nos.

3062. Petition of Charles Whittemore for license to dredge and fill solid in Buzzards Bay at Sears Point, in Wareham. Granted May 8, 1906.
3063. Petition of the town of Manchester for license to build a sea wall and pile wharf, fill solid and locate and maintain a float in Manchester harbor, in Manchester. Granted May 10, 1906.
3064. Petition of the Philadelphia and Reading Coal and Iron Company for license to repair and strengthen its wharf on Acushnet River, in New Bedford. Granted May 11, 1906.
3065. Petition of Richard M. Winfield for license to build a pile pier in West Bay at Osterville, in Barnstable. Granted May 11, 1906.
3066. Petition of Edward H. Brown for license to build a pile structure and stone pier on Taunton River, in Taunton. Granted May 17, 1906.
3067. Petition of the city of Beverly for license to lay and maintain a sewer in tide water along the beach from Water Street to Andrews Court, in Beverly. Granted May 24, 1906.
3068. Petition of the Staples Coal Company for license to build a pile wharf in its dock in Boston harbor, at East Boston. Granted May 24, 1906.
3069. Petition of Alonzo R. Wells for license to build and maintain a pile wharf in Vineyard Sound, in Falmouth. Granted May 28, 1906.
3070. Petition of John C. Rhodes for license to build a wharf in Marion harbor, in Marion. Granted May 28, 1906.
3071. Petition of Edward M. Sweeney for license to extend his wharf on Mystic River, in Boston. Granted May 29, 1906.
3072. Petition of William H. Wentworth for license to build and maintain a pile wharf in Chatham Old Harbor, in Chatham. Granted May 29, 1906.
3073. Petition of the North Packing and Provision Company for license to widen its wharf, on piles, drive piles for an engine foundation and construct a well for condensing purposes on Millers River, in Somerville. Granted May 31, 1906.
3074. Petition of the Haverhill Electric Company for license to lay cables containing wires for the conduction of electricity in and under Merrimac River, in Haverhill. Granted May 31, 1906.

- Nos.
- 3075. Petition of Ellery C. Wright for license to maintain and extend his wharf in West Falmouth harbor, in Falmouth. Granted May 31, 1906.
 - 3076. Petition of the Eagle Holt Cranberry Company for license to build a flume and draw water from Blackmore's Pond, in Wareham. Granted May 31, 1906.
 - 3077. Petition of the Metropolitan Park Commission for license to build a bridge and approaches on Mystic River at the Mystic River Reservation, in Medford. Granted June 4, 1906.
 - 3078. Petition of Earle P. Charlton and William H. Jennings for license to build and maintain a portion of a boat house, a wharf, dolphins and float on Acoaxet River, in Westport. Granted June 7, 1906.
 - 3079. Petition of Henry M. Faxon for license to extend his wharf, build two dolphins and to dredge on Town River, in Quincy. Granted June 7, 1906.
 - 3080. Petition of Ellis W. Harlow for license to fill solid at his wharf in Plymouth harbor, in Plymouth. Granted June 12, 1906.
 - 3081. Petition of Ada C. Knowlton for license to build and maintain a boat landing in Marion harbor, in Marion. Granted June 21, 1906.
 - 3082. Petition of John Duff for license to extend his wharf, on piles, in New Bedford harbor at Fish Island, in New Bedford. Granted June 21, 1906.
 - 3083. Petition of Frederick Ayer for license to build and maintain a pile pier and float in tide water near Plum Cove, in Beverly. Granted June 25, 1906.
 - 3084. Petition of the Metropolitan Water and Sewerage Board for approval of plans for a sewer crossing Spot Pond Brook and Saugus Branch Brook, in the city of Malden, as authorized by chapter 319 of the Acts of 1906. Granted June 28, 1906.
 - 3085. Petition of the Boston & Maine Railroad for license to rebuild and extend its piers Nos. 40 and 41 on Charles River, in Boston. Granted July 3, 1906.
 - 3086. Petition of the Metropolitan Park Commission for license to cut a new channel and fill a portion of the old channel of Mystic River, discontinue the old Auburn Street bridge and construct a new bridge for Auburn Street and the Mystic River Reservation roadway, in Medford and Somerville. Granted July 13, 1906.
 - 3087. Petition of the Adams Shore Land Company for license to build and maintain a pile pier and float in Quincy Bay, in Quincy. Granted July 19, 1906.
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- No.
3088. Petition of the trustees of the Bay View Improvement Association for license to extend their wharf, on piles, on Apponagansett River, in Dartmouth. Granted July 19, 1906.
3089. Petition of the trustees of the National Dock Trust for license to build a sea wall and pile wharf and to remove a portion of the present sea wall and pile wharf in the north dock on the premises of said trust in Boston harbor, at East Boston. Granted July 20, 1906.
3090. Petition of the Dyer Transportation Line for license to build a pile platform and drive fender piles in Fall River harbor, in Fall River. Granted July 20, 1906.
3091. Petition of the Union Street Railway Company for license to build a reinforced concrete bulkhead and drive fender piles on Acushnet River, in New Bedford. Granted July 20, 1906.
3092. Petition of William Bassett and L. H. Dyke for license to build and maintain a pile wharf and float in Buzzards Bay at Pocasset, in Bourne. Granted July 20, 1906.
3093. Petition of the town of West Springfield, by its board of selectmen, for license to build a sewer outlet on Connecticut River, in West Springfield. Granted July 25, 1906.
3094. Petition of Charles N. Rhodes for license to build a wharf, partly solid and partly of timber, on Merrimac River, in Haverhill. Granted July 27, 1906.
3095. Petition of the town of Hull for license to lay and maintain a 16-inch iron pipe with a tide gate therein in Hull harbor, in Hull. Granted July 27, 1906.
3096. Petition of the trustees of Lovejoy's Wharf Trust for license to build a bulkhead and fill solid on Charles River, in Boston. Granted July 30, 1906.
3097. Petition of Herman W. Friend, E. K. Friend and Harry L. Friend for license to build and maintain a wall, bulkhead and wharf, and to fill solid and extend said wharf on Annisquam River, in Gloucester. Granted Aug. 1, 1906.
3098. Petition of Michael J. Kelly for license to locate and maintain five boat landings on Connecticut River, in Springfield, Chicopee and Longmeadow. Granted Aug. 1, 1906.
3099. Petition of the Boston & Albany Railroad, the New York Central & Hudson River Railroad Company, Lessee, for license to rebuild its pier in Boston harbor at the southerly end of Clyde Street, in East Boston. Granted Aug. 15, 1906.

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Nos.

3100. Petition of George D. Flynn for license to build a sea wall and pile wharf and fill solid in Mount Hope Bay, in Fall River. Granted Aug. 15, 1906.
3101. Petition of Joseph W. Stickney for license to build a pile wharf on Chelsea Creek, in Chelsea. Granted Sept. 7, 1906.
3102. Petition of the Boston & Maine Railroad for license to widen a portion of the Fitchburg Railroad bridge and a portion of the bridge known as the old Boston & Maine Railroad bridge, on Charles River, in Boston. Granted Sept. 7, 1906.
3103. Petition of the Metropolitan Water and Sewerage Board for approval of plans for a pile structure on Chelsea Creek at the East Boston pumping station, in Boston. Granted Sept. 12, 1906.
3104. Petition of the County Commissioners of the county of Essex for approval of plans for the completion of the bridge or causeway, with approaches thereto, across Waters River at Hussey's Mill, in Danvers, authorized by chapter 381 of the Acts of 1906. Granted Sept. 12, 1906.
3105. Petition of the Lynn Gas and Electric Company for license to extend its wharf in Lynn harbor, in Lynn. Granted Sept. 12, 1906.
3106. Petition of the Savin Hill Yacht Club for license to build a foundation for a club house, also platforms and lockers in Dorchester Bay at Fox Point, in Boston. Granted Sept. 14, 1906.
3107. Petition of the New York, New Haven & Hartford Railroad Company for license to widen, on piles, a portion of its pier No. 4 in Boston harbor at South Boston, and to dredge in its dock. Granted Sept. 14, 1906.
3108. Petition of the Beverly Gas and Electric Company for license to construct and maintain two dolphins on Bass River, in Beverly. Granted Sept. 14, 1906.
3109. Petition of John H. Frazier for license to build and maintain a marine railway in Marblehead harbor, in Marblehead. Granted Sept. 14, 1906.
3110. Petition of the Boston Rubber Shoe Company for license to build bulkheads and fill solid on Malden Canal, in Malden. Granted Oct. 1, 1906.
3111. Petition of the Okahawis Canoe Club for license to build a pile structure for the support of a club house, and to locate and maintain a float on Danvers River, in Beverly. Granted Oct. 1, 1906.

Nos.

3112. Petition of the County Commissioners of the county of Essex for approval of plans for the construction of a highway bridge and approaches, over Danvers River, in Salem and Beverly, as authorized by chapter 371 of the Acts of 1903. Granted Oct. 3, 1906.
3113. Petition of the Page Manufacturing Company for license to lay and maintain a pipe and construct a well in Clark's Cove, in New Bedford. Granted Oct. 5, 1906.
3114. Petition of the New York, New Haven & Hartford Railroad Company for license to reconstruct and widen the bridge on its main line across Taunton River, in Fall River and Somerset. Granted Oct. 9, 1906.
3115. Petition of the Plymouth Cordage Company for license to build a sea wall and pile wharf, to fill solid and dredge in Plymouth harbor, in Plymouth. Granted Oct. 9, 1906.
3116. Petition of the Boston & Maine Railroad for license to build stone piers and pile and timber structures in and over Millers River at Austin Street in Boston and Prison Point Street in Cambridge. Granted Oct. 15, 1906.
3117. Petition of Albert Watts for license to fill solid and to dredge in Boston harbor, in Winthrop. Granted Oct. 19, 1906.
3118. Petition of the New York, New Haven & Hartford Railroad Company for license to rebuild three bridges on its Dean Street branch on Taunton River, in Taunton. Granted Oct. 19, 1906.
3119. Petition of the trustees of the Winthrop Development Trust for license to fill solid in Boston harbor at Point Shirley, in Winthrop. Granted Oct. 19, 1906.
3120. Petition of the Burgess Cranberry Company for license to build dikes and flumes and draw water from Gibbs Pond, in Nantucket. Granted Oct. 19, 1906.
3121. Petition of Henry H. Fay for license to extend his marine railway in Woods Hole Great Harbor at Woods Hole, in Falmouth. Granted Oct. 29, 1906.
3122. Petition of Helen L. Butterfield for license to build and maintain a pier and float in Marion harbor, in Marion. Granted Oct. 29, 1906.
3123. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Nov. 12, 1906.
3124. Petition of the Boston Elevated Railway Company for license to dump snow and ice into tide waters. Granted Nov. 12, 1906.

No.

3125. Petition of the Metropolitan Park Commission for approval of plans for building a dam across Mystic River at Cradock bridge, in Medford, under authority of chapter 445 of the Acts of 1904. Granted Nov. 16, 1906.
3126. Petition of Francis W. Lawrence and Harry H. Wiggin for license to build a sea wall and pile wharf, to fill solid and dredge on Mystic River, in Boston. Granted Nov. 16, 1906.
3127. Petition of Charles P. Babson, guardian, for license to build a wharf in Folly Cove, in Rockport. Granted Nov. 16, 1906.
3128. Petition of the city of Haverhill for license to construct a sewer outlet on Merrimac River, in Haverhill. Granted Nov. 21, 1906.

MISCELLANEOUS PERMITS GRANTED DURING THE YEAR.

- BROWN-WALES COMPANY, to change the location of portion of a railroad track authorized to be laid in C and Egmont streets on the Commonwealth flats, at South Boston. Granted Dec. 4, 1905.
- BAY STATE DREDGING COMPANY, to dump material dredged in Chelsea Creek on flats belonging to the Forbes Lithograph Company, in Revere. Granted Dec. 8, 1905.
- ISAAC BLAIR & Co., to dump snow from Dover Street bridge into tide water, in Boston. Granted Dec. 11, 1905.
- BROWN-WALES COMPANY, to change the location of portion of a railroad track authorized to be laid in C and Egmont streets on the Commonwealth flats, at South Boston. Granted Jan. 1, 1906.
- JOHN F. COYLE, to dump on the Commonwealth flats, at South Boston, material taken from excavations in the city of Boston. Granted Jan. 2, 1906.
- JAMES F. SWEENEY, to dump on the Commonwealth flats, at South Boston, material taken from excavations in the city of Boston. Granted Jan. 2, 1906.
- T. F. WHOLEY, to dump ashes on the Commonwealth flats, at South Boston. Granted Jan. 5, 1906.
- R. S. BRINE TRANSPORTATION COMPANY, to dump on the Commonwealth flats, at South Boston, material taken from excavations in the city of Boston. Granted Jan. 15, 1906.
- ADAMS BROTHERS, to use for storage purposes a portion of the Commonwealth flats, at South Boston. Granted Jan. 19, 1906.

- JAMES MCGOVERN, to dump on the Commonwealth flats, at South Boston, material taken from excavations in the city of Boston. Granted Jan. 29, 1906.
- J. FEINBERG & SON, to use for storage purposes a portion of the Commonwealth flats, at South Boston. Granted Jan. 31, 1906.
- BETTS BROTHERS & Co., to dredge material from Shirley Gut. Granted Feb. 15, 1906.
- BAY STATE DREDGING COMPANY, to dredge material from Shirley Gut. Granted Feb. 26, 1906.
- W. H. ELLIS, to dredge material from Shirley Gut. Granted March 13, 1906.
- EASTERN DREDGING COMPANY, to dredge material from Shirley Gut. Granted March 13, 1906.
- DEPARTMENT OF COMMERCE AND LABOR OF THE UNITED STATES, to erect three iron structures, to be used as "naval speed trial beacons," on land of the Commonwealth, at Provincetown. Granted March 28, 1906.
- NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY, to lay and operate tracks on the Commonwealth flats, at South Boston. Granted April 2, 1906.
- BAY STATE DREDGING COMPANY, to dump material dredged in Chelsea Creek on flats in Charles River, at Cambridge end of Brookline Street bridge. Granted April 5, 1906.
- W. H. ELLIS, to dredge material at and near the wharf at the northerly end of Deer Island. Granted April 5, 1906.
- SOUTH BAY WHARF AND TERMINAL COMPANY, to purchase and acquire certain lands on Massachusetts Avenue and Southampton Street, in Boston. Approved April 24, 1906.
- TRUSTEES OF THE MAIN STREET LAND TRUST, to dredge material from their flats in Charles River on the Cambridge side of the channel, near Cambridge bridge. Granted April 30, 1906.
- ELLEN M. BOARDMAN, to remove gravel from Salter's beach, in Plymouth. Granted May 2, 1906.
- DORCHESTER YACHT CLUB, to dredge a channel and basin in Dorchester Bay, in Boston. Granted May 8, 1906.
- C. W. JOHNSON, to remove rocks from the channel of Connecticut River at the "Rapids," between Northampton and South Hadley. Granted May 21, 1906.
- JOHN B. TURNER, to remove gravel from the beach, at North Scituate. Granted May 21, 1906.
- EASTERN DREDGING COMPANY, to dump material dredged from Mystic River. Granted May 22, 1906.
- HUGH FARRELL, to dredge sand and gravel in Boston harbor, near Deer Island. Granted May 31, 1906.

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DAVID BENVENEDOL, to remove stones, kelp and sea weed from a portion of Park Beach in Weymouth. Granted June 8, 1906.

FRED O. ANDREWS and E. J. J. VERRILL, to use and occupy a part of Berry Island in Lake Weymouth, in Hallowell. Granted June 11, 1906.

JAMES F. DOOLEY, to dump in the Commonwealth flats, at South Boston, material taken from excavations in the city of Boston. Granted June 11, 1906.

JOHN F. COYLE, to dump in the Commonwealth flats, at South Boston, material taken from excavations in the city of Boston. Granted June 15, 1906.

THE MASSACHUSETTS STEEL CASTING COMPANY, to dredge in Malden River. Granted July 17, 1906.

T. F. WHELAN, to dump engine ashes in the Commonwealth flats at South Boston. Granted July 17, 1906.

BAY STATE DREDGING COMPANY, to dump material dredged in Chelsea Creek on flats belonging to Forbes Lithograph Manufacturing Company, in Boston. Granted July 21, 1906.

W. H. EAMES, to dredge material from the bar at the entrance to Shirley Gut. in Boston Harbor. Granted Aug. 1, 1906.

THE L. R. TILD COMPANY, to use for storing and sorting oak piles a portion of the Commonwealth flats, at South Boston. Granted Aug. 15, 1906.

THE TIDE WATER BROKEN STONE COMPANY, to use for landing, storing and removing broken stone a portion of the Commonwealth flats, at South Boston. Granted Sept. 7, 1906.

NANTASKET BEACH STEAMBOAT COMPANY, to remove accumulations of sand in the berths and around Pemberton pier, in Hull. Granted Sept. 24, 1906.

THE R. S. BRINE TRANSPORTATION COMPANY, to dump on the Commonwealth flats, at South Boston, material taken in the city of Boston. Granted Sept. 24, 1906.

JOHN CASHMAN, to place five guy ropes on a portion of the Commonwealth flats, at South Boston. Granted Oct. 9, 1906.

MILTON DA COSTA, to use and occupy Quarantine Rock, in Boston harbor. Granted Oct. 9, 1906.

R. W. BIRD, to remove gravel from the beach at Crow Point, in Hingham. Granted Oct. 19, 1906.

SURVEYS AND OTHER ENGINEERING WORK.

During the year, in addition to the surveys made for the location of town boundaries and the survey of the boundary line between Massachusetts and Connecticut, the engineering force has been engaged in making plans, specifications and estimates for, and supervising the construction of, sea walls, jetties, breakwaters and river bank protective works, and in dredging anchorage basins and channels in many of the rivers and harbors of the Commonwealth. This work included the surveys necessary to ascertain if the work had been properly executed. Inspections have been made of structures and filling done in tide water under licenses which required the payment of compensation for tide water displaced; and measurements and calculations were made of the amount of displacement. In addition to the above work, surveys have been made at the following places: —

In Boston harbor: —

At Shirley Gut, to determine the amount of excavation required to render the navigation of the channel safe for steamers which desired to use it.

Of the channel leading to the Winthrop wharves, to determine the location of the shoals, of which complaint had been made.

Of the channel leading to the wharf at Cottage Park, Winthrop, in connection with plans for channel improvement.

Of Mystic River, from Chelsea bridge to the western division of the Boston & Maine Railroad, for information required in connection with petitions for its improvement.

In other parts of the State: —

Of the Connecticut River, at Holyoke, for data to determine the best location for a line limiting proposed structures along the river bank.

Of the beaches at North Scituate and at the Third Cliff, Scituate, in connection with the construction of sea walls.

Of portions of Ipswich River, to determine the amount of dredging required.

Of West Falmouth harbor, in connection with making plans for its improvement.

Of a portion of Nantucket harbor near the steamboat wharf, to determine the amount of dredging required.

Of the entrance to Deacon's Pond, Falmouth, in connection with the proposed improvement.

Of the channel in Plymouth harbor leading to the wharf of the Plymouth Cordage Company, in connection with making plans for its improvement.

Of a portion of Edgartown harbor, for information in connection with the granting of licenses for wharf structures.

Of Wenham Pond and the island therein, at East Carver, for information in connection with an application for lease of the island.

Of Witchmere harbor, Harwichport, in connection with the preparation of plans for its further improvement.

Of the mouths of Herring River and Bass River, and the entrances to East and West bays at Osterville, for the purpose of determining the changes which had taken place since the completion of the improvements.

Of Menamsha Inlet, in Gay Head and Chilmark, in connection with the preparation of plans for its further improvement.

The results of these various surveys have been plotted and the plans filed for future use.

Considerable incidental work has been done in preparing estimates, and in the study of various projects for improvements on the Commonwealth flats and elsewhere.

APPROPRIATION FOR SURVEY AND IMPROVEMENT OF HARBORS.

By chapter 16 of the Acts of 1905, an appropriation of \$5,000 was made for surveys of harbors and for improving and preserving the same, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth.

The following expenditures from this appropriation, in addition to those recited in the last report, were made in December, 1905, under the authority of section 9 of chapter 96 of the Revised Laws: —

East Bay, Osterville,	\$850 00
Lewis Bay,	692 50
Stage harbor, Chatham,	1,307 49
Witchmere harbor,	306 94
<hr/>	
Total,	\$3,156 93

In 1906 the appropriation for the same purpose was \$4,583.33, from which sum expenditures have been made to Dec. 1, 1906, in the localities and to the amounts following, viz.:—

Annisquam River,	\$13 89
Bass River, Yarmouth,	172 35
Connecticut River, Hadley,	1,437 01
Deacon's Pond, Falmouth,	7 00
East Bay, Osterville,	1,175 73
Edgartown harbor,	174 14
Herring River,	111 77
Ipswich River,	134 47
Lake Anthony,	11 89
Menamsha Inlet,	174 89
Mystic River,	211 12
Nantucket harbor,	47 21
Plymouth harbor,	8 00
West Bay, Osterville,	69 87
Winthrop Channel,	90 00
Winthrop harbor,	78 00
Witchmere harbor,	81 96
<hr/>	
Total,	\$3,999 30

HARBOR COMPENSATION FUND.

There was paid into the treasury of the Commonwealth during the year, under chapter 146 of the Acts of 1897 and chapter 96 of the Revised Laws, for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of \$48,065.28, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1906, was \$577,572.19; the balance of income from this fund in the treasury on the same date was \$46,864.26; the total income for the year was \$22,006.10.

COMMONWEALTH'S FLATS IMPROVEMENT FUND.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1905, was \$1,350,056.51. To this has been added during the year \$47,344.75 from the income of the fund and \$28,020.20 from rents of lands and other sources, making a total of \$1,425,421.46. Of this sum there has been expended during the year \$206,270.14, leaving a balance on Nov. 30, 1906, of \$1,219,151.32, subject to reduction for existing liabilities by reason of the anchorage basin contracts under chapter 476 of the Acts of 1901, and for contribution toward building Northern Avenue and bridge under section 4 of chapter 381 of the Acts of 1903.

The foregoing report is respectfully submitted.

GEORGE E. SMITH,
HENRY J. SKEFFINGTON,
SAMUEL M. MANSFIELD,

Commissioners.

DEC. 1, 1906.

APPENDIX.

APPENDIX.

[See page 12 of this report, *ante*.]

LICENSE TO NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY.

WHEREAS, The New York, New Haven & Hartford Railroad Company has applied to the Board of Harbor and Land Commissioners for authority to lay and operate a track on the Commonwealth's flats at South Boston, —

Now, said Board, by virtue of the powers thereto enabling in the name of the Commonwealth, hereby authorizes and licenses said New York, New Haven & Hartford Railroad Company to lay, maintain and operate, by steam or electric power, railroad tracks from its yard north of Congress Street, in, over and across said Commonwealth's flats in the location and to the extent shown on the accompanying plan marked "Plan of proposed tracks on the South Boston flats. Scale 1-1000. March, 1906. Frank W. Hodgdon, Chief Engineer," provided, however, that this license is granted upon the following conditions, viz., that: —

First, said tracks shall be laid at grade 16.5 feet above mean low water and maintained in good repair, at the expense of the licensee.

Second, proper drains and culverts shall be built by the licensee for the purpose of removing surface water from the areas south of the tracks.

Third, crossings for vehicles shall be built and maintained by the licensee opposite entrances to all leased premises and at other reasonable places as may be required from time to time by said Board, together with the proper provision for public safety at the same.

Fourth, the location of the tracks shall be changed by and at the expense of the licensee whenever required by said Board, but the new location shall have as easy grades and curves as the one shown on said plan.

Fifth, said Board may connect other tracks with the one shown on said plan, and the licensee agrees that so long as it retains its tracks upon the land of the Commonwealth by virtue of this license it will operate transportation over all said tracks, when con-

nected in a proper manner, for the benefit of other parties occupying said land, provided that such parties shall first sign the usual agreement required by the licensee in connection with operating sidetracks, so far as the provisions of said agreement may apply; and the licensee also agrees to permit the use of said tracks by any other person or corporation licensed therefor by said Board upon such reasonable terms as may be agreed upon, or in case of disagreement, as the Board of Railroad Commissioners of the Commonwealth may determine.

Sixth, the licensee shall assume and pay all claims and demands arising in any manner from the construction, maintenance, use and operation of the tracks shown on said plan, and shall save harmless and indemnify the Commonwealth from all claims, suits, damages, cost and expense by reason thereof.

Seventh, the licensee shall observe all statutes of the Commonwealth, and rules and regulations of this Board applicable to the tracks authorized and things appertaining thereto or connected therewith.

Eighth, the section of single track shown on said plan from the railroad land to the first switch shall not be used for storing cars, nor shall cars be left standing thereon beyond a reasonable time for shunting.

Ninth, this license may be revoked by this Board whenever in its opinion public interests require, and thereupon, after due notice within reasonable time not exceeding three months the licensee shall remove all tracks laid by it and designated in the order of revocation.

Tenth, the action of the licensee in laying the tracks shown on said plan shall be construed as its acceptance of the license, and its agreement to comply with the conditions herein set forth.

IN WITNESS WHEREOF, said Board of Harbor and Land Commissioners hereunto set their hands this second day of April, in the year nineteen hundred and six.

WOODWARD EMERY.

GEO. E. SMITH,

HENRY J. SKEFFINGTON,

Harbor and Land Commissioners.

COMMONWEALTH OF MASSACHUSETTS.

Approved by the Governor and Council.

BOSTON, April 11, 1906.

EDWARD F. HAMLIN,
Executive Secretary.

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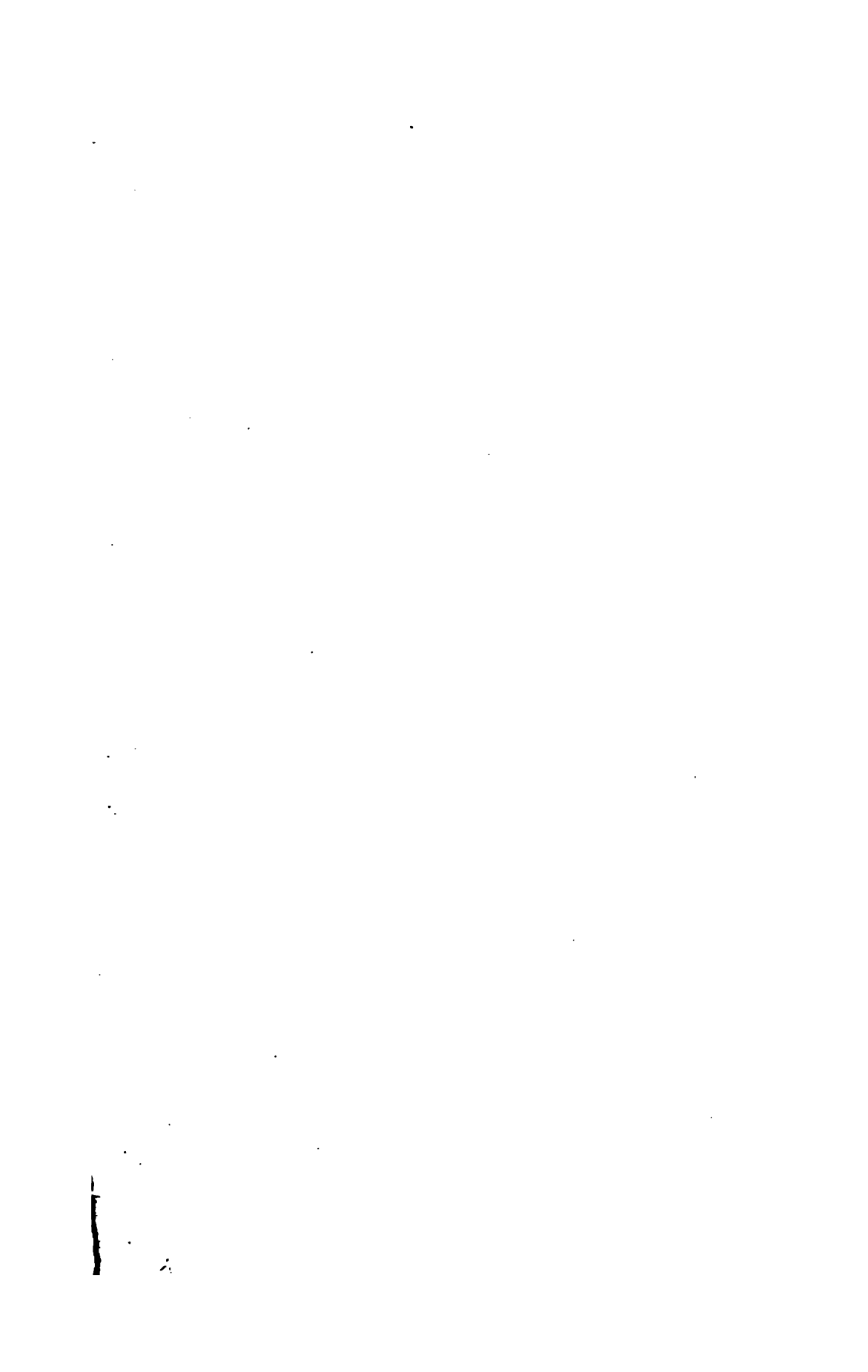
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